Vol. 36 JANUARY, 1943 No. 3

QUARTERLY
OF THE

NATIONAL FIRE PROTECTION ASSOCIATION

"To Promote the Science and Improve the Methods of Fire Protection and Prevention."

PUBLISHED QUARTERLY AT BOSTON, MASS., BY THE
NATIONAL FIRE PROTECTION ASSOCIATION

Printed in U. S. A.

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Vol. 36 January, 1943 No. 3

QUARTERLY

OF THE

National Fire Protection Association

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National Fire Protection Association

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A NON-PROFIT TECHNICAL AND EDUCATIONAL ORGANIZATION

To promote the science and improve the methods of fire protection and prevention.

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Western Sprinkled Risk Association.
Western Underwriters Association.
West Virginia Fire Underwriters' Association.
West Virginia Inspection Bureau.

More than six thousand Associate Members.

Executive Office, 60 Batterymarch Street, Boston, Mass., U. S. A.

Printed in U. S. A.

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Providence Journal.

This huge shipyard fabricating building in Providence, R. I., burned on December 31, 1942. The frame of the building was steel, and the contents heavy machinery and steel in process, but the walls were plywood and the roof wooden plank. No automatic sprinklers were provided, and there was no fire wall between the small section at the left, where the fire started, and the main area. Employees fought the fire for 15 minutes before calling the Providence Fire Department. The management claimed that there was no serious delay in production because the work could be continued outdoors.

The Quarterly

Vol. 36 January, 1943 No. 3

Meeting of Board of Directors.

New York, January 19, 1943.

Present.

Albert T. Bell, Chairman
David J. Price, President
Richard E. Vernor, Vice-President
C. C. Johnson, Vice-President
Alvah Small, Past President

A. L. Brown
George W. Elliott
Frank A. Epps
C. C. Hannah
W. F. Hickey
W. E. Mallalieu
H. L. Miner
C. W. Pierce
W. J. Scott
E. O. Shreve
W. C. Wagner
John L. Wilds

Percy Bugbee, General Manager
Robert S. Moulton, Technical Secretary
Charles S. Morgan, Engineer

Business Transacted.

1. The program for the 1943 annual meeting was considered and referred to the Program Committee with power.

2. The following Executive Office reports were made:

(a) Membership—Robert S. Moulton, Technical Secretary.
(b) Advertising—Charles S. Morgan, Advertising Manager.
(c) Publications—Robert S. Moulton, Technical Secretary.
(d) Field Service—Percy Bugbee, General Manager.
(e) Fire Marshals Section—Chas. S. Morgan, Asst. Executive Secretary.
(f) Volunteer Firemen's Section—Percy Bugbee, General Manager.

3. Messrs. Bugbee and Moulton reported on various contacts with U. S. Government agencies and other staff activities pertaining to the war effort. It was voted to receive these reports with an expression of interest and commendation of the N.F.P.A. staff.

A report was made by General Manager Bugbee on the activities of the Army Fire Prevention Advisory Council, and it was voted to approve in principle the position taken by this committee, particularly with regard to the protection of industrial properties essential to war production.

4. The desirability of an N.F.P.A. Committee on Post War Planning was discussed and the matter tabled, but with the understanding that the subject is to be placed on the agenda of the next meeting of the Board for further discussion.

5. Mr. Alvah Small was unanimously selected on behalf of the N.F.P.A. as representative of the Fire Protection Group on the Board of Directors of the American Standards Association.

6. A report by Chairman Alvah Small of the Electrical Field Service Committee on the current activities and current financial situation with respect to this service was received.

7. A question concerning the status of the National Lightning Protection Association was referred to the Advisory Committee for report to the Board at its next meeting.

8. The following report of the Committee on Technical Committee Procedure was presented by Chairman Pierce:

The N.F.P.A. technical committees during the current Association year are largely limiting their activities to matters having immediate bearing on the war effort in line with the previously established policy, approved by the Board of Directors, that during the war emergency we should not ask committee members to devote time to anything except the most essential matters. Accordingly the normal N.F.P.A. committee activity has been substantially reduced.

Wherever they could be of any special service in connection with the war effort, our committees have been active and have endeavored to proceed with the utmost speed on all emergency matters. We have felt that in view of the emergency we should not insist upon compliance with all the technicalities of procedure and should consider only the results obtained so long as they represent a consensus of opinion and are consistent with the spirit of the N.F.P.A. procedure.

As previously reported, the Electrical Committee is continuing to promulgate war emergency amendments of the National Electrical Code as occasion requires under their established procedure for tentative interim amendments. These amendments, for the duration only, are subject to further review and official Association action in due course, with adequate provision for safeguarding the integrity of the Association's standards. War emergency amendments of the Standards on Blower Systems and on Paint Spraying and Spray Booths have been promulgated by the Committees on Blower Systems and on Finishing Processes to permit the use of treated wood or plastic fan blades. These war emergency amendments have been approved by substantially unanimous votes of the committees concerned. We have not attempted to establish any rules and regulations for the handling of

such war emergency amendments in the various committees, feeling that to do so might hamper prompt action and that we can rely upon the discretion of our technical committees. All such emergency amendments, like those promulgated by the Electrical Committee, are for the duration only and are subject to further Association action in due course before any final and official changes are made in the standards.

Our Committee on Firemen's Training has been particularly active in developing material in its field to meet the requests of the Office of Civilian Defense. Our Committee on Signaling Systems and Thermostats is also working on a special problem at the request of the Office of Civilian Defense, advising on the part that municipal fire alarm systems should play in the air raid signaling set-up. The Committee on Automatic Sprinklers has created a special War Emergency Committee to advise governmental agencies and others on request and to recommend to the main committee any war emergency amendments which may appear desirable. Nothing has as yet come before this emergency committee, but it is ready to function promptly in case of need.

It was voted to adopt the report, and to confirm the several technical committee appointments appearing in the 1942 Year Book made by the Committee on Technical Committee Procedure subsequent to the June meeting of the Board.

9. The following technical committee appointments were confirmed:

Air Conditioning.

E. C. Epple, American Institute of Architects, replacing Jesse L. Bowling.

Electrical—Limited Membership.

W. C. Poole, American Petroleum Institute.

Farm Fire Protection.

Ralph R. Botts, U. S. Department of Agriculture, replacing William H. Rowe.

Firemen's Training.

Clarence E. Ridley, International City Managers Association.

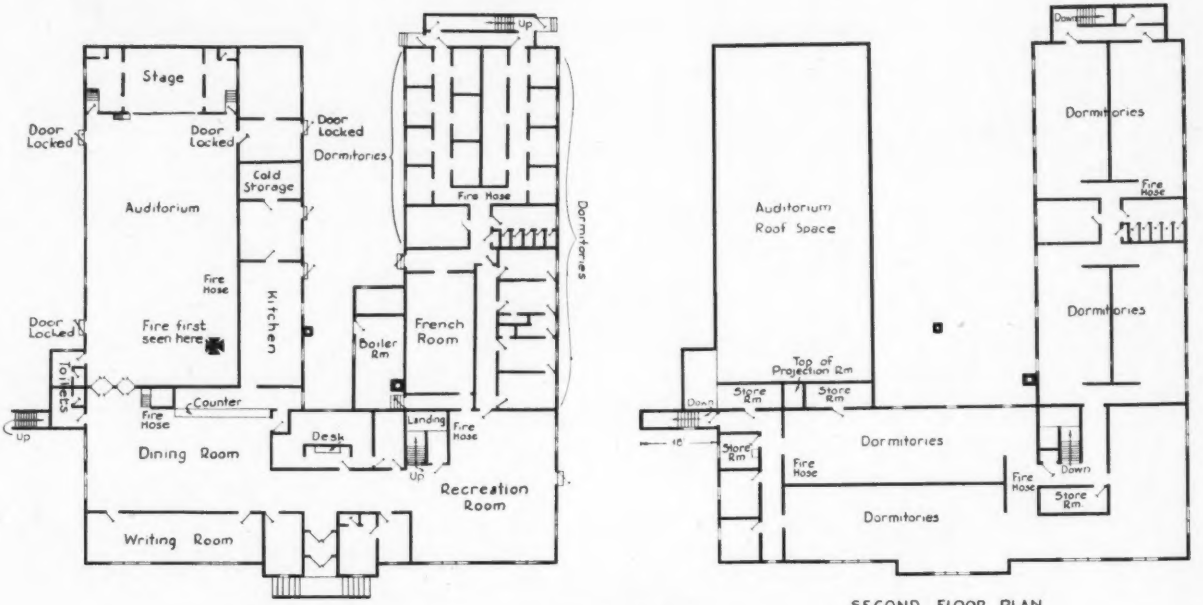
Thomas S. Ward, Fire Protection Officer, Office of Civilian Defense, San Francisco.

Municipal Fire Apparatus.

John H. Alderson, Chief, Fire Department, Los Angeles, Calif.

Trailers and Trailer Camps.

H. G. Knoderer, National Electrical Manufacturers Association, replacing J. H. Edwards.



FIRST FLOOR PLAN

SECOND FLOOR PLAN

K OF C HOSTEL & RECREATION HUT

Approximate Scale in Feet

0 5 10 15 20 25 30

St. John's Hostel Fire.

Exactly two weeks to the day after the Cocoanut Grove night club holocaust in Boston, Mass., a similar tragedy occurred at St. John's, Newfoundland, when fire razed a Knights of Columbus hostel. On December 12, 1942, ninety-nine people, many of them Canadian, American and British servicemen, died in the flames, and one hundred and nine others suffered injuries.

The building where the fire occurred was a two-story light frame structure offering sleeping accommodations for three hundred men. On the ground floor of the U-shaped building were located a service-men's canteen and dining room, reading room, kitchen and cold storage room. Separated from the dining room by a narrow passageway was a large auditorium where the majority of the victims were trapped when the fatal fire occurred. Staff rooms, recreation rooms and sleeping quarters were located in the other wing of the hostel. The entire second floor was occupied as a dormitory. Windows were provided with black-out shutters, and exits were marked by red lights.

Story of the Fire.

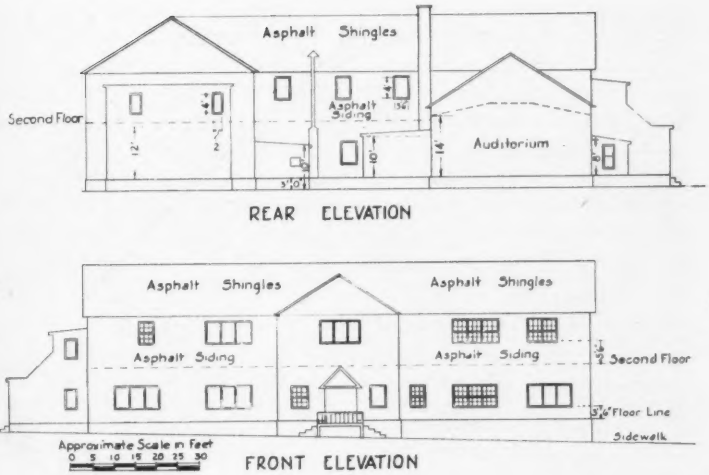
On Saturday night, December 12, approximately four hundred persons were crowded into the main auditorium, where a Christmas party and barn dance was being held for members of the various armed forces and their guests. At a few minutes past eleven, while members of "Uncle Tim's Barn Dance Troupe" were broadcasting a radio program from the stage of the auditorium, someone noticed smoke and fire coming from the direction of the kitchen. A burst of flame ignited combustible Christmas decorations draped from the ceiling. Fire streaked through the ballroom and blazing festoons fell to the floor, igniting the hair and clothing of the merrymakers. Panic-stricken, they rushed for the exits, overturning chairs and trampling upon one another in their mad dash for safety. The lights then went out, adding greatly to the confusion.

Survivors reported that the door on the west (left) side of the ballroom was barred and that there was no key in the lock. Soldiers and sailors formed a ring around the struggling crowd while other servicemen battered down the door. An exit on the opposite side of the room was also found locked, and when the crowd had burst through this door, they were confronted by another, also barred. Those people who were on the stage taking part in the radio broadcast at the time of the fire escaped by ripping the blackout shutter from a window in the stage section, smashing the glass and dropping ten feet to the ground. Two canteen workers escaped by way of a door leading from the cold stor-

This report is based on statements of persons present at the fire as reported in the St. John's newspapers, in the absence of receipt of reports from any other sources. The sketches have been drawn from plans secured from the Knights of Columbus headquarters in Ottawa through the courtesy of Dominion Fire Commissioner W. L. Clairmont.

The hostel burned so furiously that the fire department could do little but protect surrounding property after they arrived at the fire.

The ruins.



age room in the rear of the kitchen. Many people were trapped in their rooms on the second floor by the lightning-like rapidity with which the flames spread. Others leaped to safety from the windows. It is believed that the smashing of many windows created a strong draft, which contributed to the quick spread of the fire through the lightly constructed building.

Fire Fighting Activities.

At 11:17 P.M. an alarm was received at the St. John's Fire Department headquarters located only five hundred yards from the hostel. Three city fire brigades were on the scene in a few minutes. However, upon their arrival flames were already shooting from the roof and from the windows. The heat was so intense that little rescue work was possible, and firemen largely confined their efforts to preventing the flames from communicating to near-by buildings. The fire fighters used ten hose lines, and with the assistance of auxiliary brigades and armed units brought the blaze under control at approximately 2:30 A.M. The hostel burned to the ground, nothing remaining of the building but two smoking chimneys.

Conclusions.

Reports on the origin of the fire differ greatly. The master of ceremonies directing the radio broadcast from the stage at the time of the blaze informed reporters that he saw flames and smoke coming from the kitchen at the opposite end of the auditorium. A minute later he discovered that the stage draperies behind him were ablaze. Fire fighters believe that the fire originated in the kitchen, although the cause has not as yet been determined.

Panic was the most important contributing factor to the heavy loss of life. As in other disasters of this type, firemen upon entering the building found bodies jammed against the exits. Although the doors were marked by red lights, this precaution proved useless when all the lights in the building were extinguished a few minutes after the fire was discovered. There were three contributing factors to the speed with which the flames swept through the building: the use of flammable decorations, the draft created when windows were smashed in an effort to escape from the building, and the inferior frame construction of the hostel.

Training for Port Security.

Fort McHenry Training Station of the U. S. Coast Guard.

As this is written about two hundred men march out of the Fort McHenry Training Station every six weeks especially trained in port security work. Port security is one of the important war duties of the Coast Guard. Trained men and valuable material are being transported to and concentrated in the several ports of embarkation for shipment to the fighting fronts. It is recognized that no less disastrous than a torpedo to such men and weapons might be a fire, incendiary or accidental, during the all-important period of loading when concentration of these tools of war is necessary.

The Navy, Coast Guard and Merchant Marine are responsible for the convoy work, but the Coast Guard Port Security units have the peculiar responsibility for protecting ports, vessels and waterfront facilities against damage and destruction from sabotage, accidents and negligence.

On February 25, 1942, the Secretary of the Navy entrusted the Coast Guard with port security duties, and it now has about 25,000 men engaged in this work. The Coast Guard operates its port security units through the offices of the various captains of the port, who have the necessary authority to deal with the situations involved. Since port security training was started at Fort McHenry in June, a total of 1135 officers and men have been graduated to go to work in the all-important port security units throughout the country.

Plans have been completed to materially step-up the rate at which trained men may be put into the field. The present instruction course is comprehensive, covering six full weeks. An additional 100 to 200 men will be given a condensed two weeks' course. This new course will resemble the present six weeks' course in essence, but it will of necessity be concerned only with highlights of the instruction. This will make it possible for a total of about 5000

This account is furnished through the courtesy of the U. S. Coast Guard Training Station at Fort McHenry, Baltimore, Maryland, which is under the direction of Commander J. L. Steinmetz. On the instruction staff of the school are N.F.P.A. members, Lieutenant Commander Lloyd Layman, Lieutenant Commander F. A. Hoffman, and Lieutenant (j.g.) V. C. Swanson.

Among the duties for which men are being trained at the Fort McHenry Training Station is to man a fleet of some 250 fire boats. A number of these boats are trawlers and other converted vessels such as the one illustrated. These craft carry from 2 to 6 self-contained 500 g.p.m. pumping units.

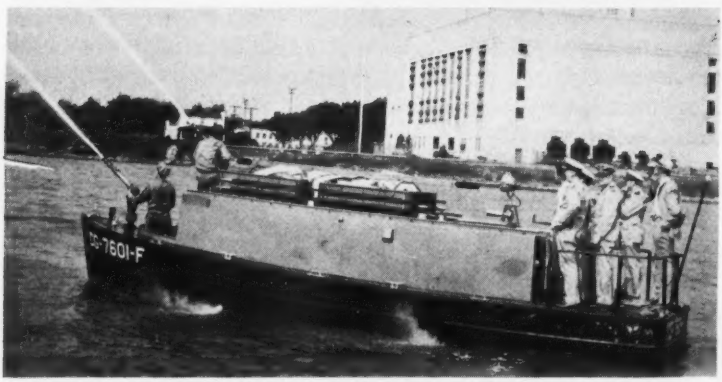
coast guardsmen to receive the port security training at Fort McHenry each year.

An average class in the regular six weeks' course consists of about 30 officers, 35 chief petty officers and 130 enlisted men. Upon entering the school all men, regardless of rate or rank, assume the status of students.

A certain part of the rigorous and intensive six weeks of training is devoted to various subjects of importance to any member of the Coast Guard. The "Captain of the Port Manual," for example, becomes practically the Bible of the student at Fort McHenry. He is thoroughly drilled in the duties and authority of the Captain of the Port and the sources of that authority. Instruction also covers the fundamentals of small boat navigation, rules of the road, compass reading, problems of piloting, meaning and uses of international code flags, sending and taking of messages in the blinker system and semaphore, first aid, and the use and care of small arms. Physical training includes calisthenics, boat drill, close order drill, rifle drill and self-defense, including the learning and executing of jujitsu holds and breaks.

The technical instruction at the school falls into three general categories: police work, fire prevention, and fire fighting.

In the police field the instruction covers the law of arrest, nature and definition of crimes, and law of evidence as they apply to Coast Guard duties. Additional training covers crime investigation procedure, such as interviewing witnesses and suspects, picking up and preserving fingerprints.



Among fire boats being operated by the U. S. Coast Guard for port protection, 101 are of a jet-propelled type illustrated in two views above. Produced by the Handley Engineering Service of Prospect, Ohio, these have an overall length of 35 feet 6 inches, a motor beam on deck of 10 feet 6 inches, and a draft of only 18 inches. The boats are equipped with four pumps, each capable of ejecting 700 g.p.m. at 120 pounds pressure. To propel the boat, water is sucked in through a forward opening and discharged through an opening aft. Valves may be shifted to reverse the flow or to eject the water through monitor nozzles or hose streams. The vessels are able to move at about 10 knots.

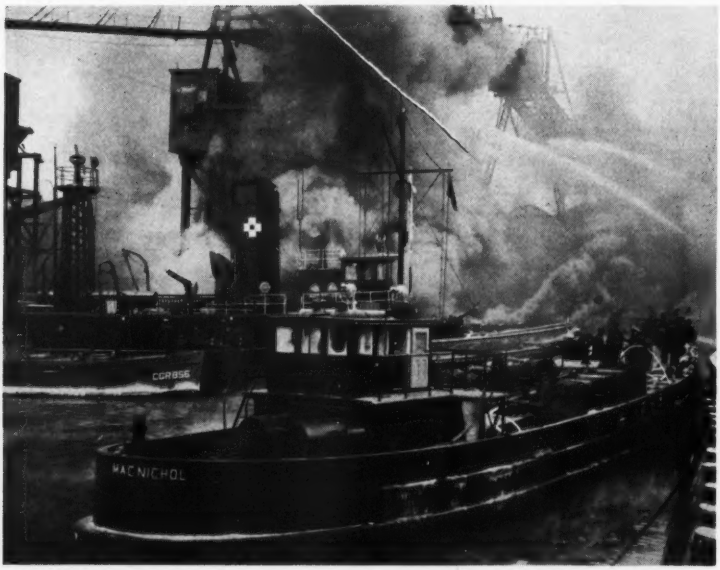
Actual guard duty occupies a great deal of the time of any Coast Guardsman in port security work, and he receives instruction from a carefully prepared "Civilian Guard Manual," covering the general manner in which guards must conduct themselves. Other features of guard duty instruction include means of communication while on duty, the particular things to look for in making inspections, and perhaps the most important of all, means of securing the coöperation of civilian guards.

The trainee is introduced to the field of fire prevention and protection by a course in the practical principles of combustion, heat transmission, and extinguishment. The transmission of heat by conduction, radiation, and convection is demonstrated in the classroom, and the essential elements necessary for combustion to take place are carefully explained. The student is next drilled in the fundamentals of gases and liquids, their specific gravity, vapor density, flash point, explosive range, ignition temperature, and their miscibility with water.

Having been drilled in the basic elements of fire, the student is then familiarized with common fire hazards, such as matches and smoking, wiping rags and waste, and their adaptability to sabotage. The trainee becomes conversant with the inspector's sheet, inspection methods, and the types of things to look for in making his inspections. The fundamentals of "good housekeeping" are impressed on him and he becomes aware of the fact that the most effective way to combat fire is to prevent it. In this connection the student is taught the value of obtaining the coöperative assistance of private business and industry in his port, as well as that of the fire department.

As the Port Security is primarily concerned with ships and waterfront property, lectures are given on the construction of ships and piers. The construction of cargo ships and tankers and fire prevention methods aboard them are studied thoroughly, and tours are made of shipyards in Baltimore harbor. The problems involved in loading explosives aboard ship and the precautions necessary are also studied. The trainee is instructed in the different types of construction of piers and wharves, and the importance of fire walls, draft stops, sprinkler systems and like protection. He is taught what to look for and what to recommend in inspecting piers and wharves.

As sprinkler systems are considered the best single means of fire protection, they are closely inspected. Samples of different sprinkler heads are examined in the classroom and the method of operation is studied. The trainee becomes aware that there are conditions under which a sprinkler system will not work, but the importance of its presence as a fire protection device is emphasized. The different colors of the heads and where they should be installed, the importance of regularly checking the water supply, and the methods of testing the alarm valves are all noted. The method of operation of standpipes is also studied.

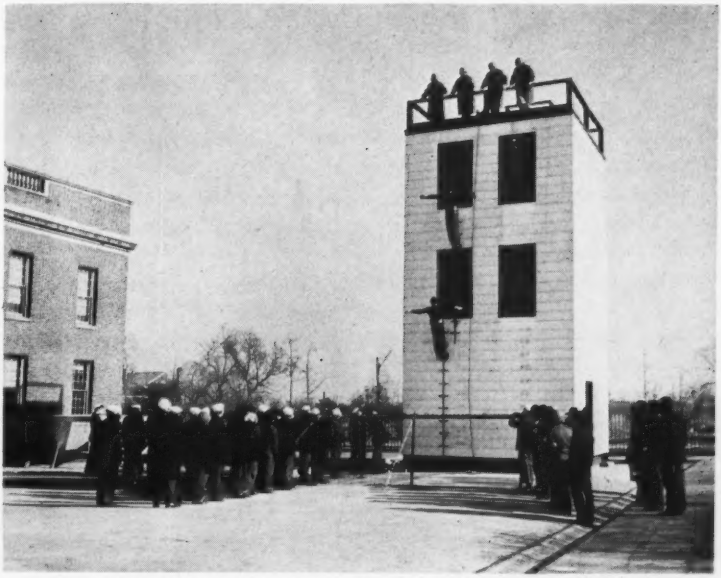


International.

A U. S. Coast Guard fire boat is shown at a recent coal wharf fire in Boston. Converted from a commercial vessel, the boat is typical of a fleet of fire boats operated by the Coast Guard as a part of its port security program. The vessel's pumping capacity of 4000 gallons per minute is obtained by means of eight self-contained 500 g.p.m. pumping units powered by individual gasoline motors. These pumps are connected to discharge manifolds supplying three monitor nozzles and numerous connections for hose streams. In the background is a larger municipal fire boat.

The student passes next to the problem of actual fire fighting. He is taught to distinguish "Class A," "Class B" and "Class C" fires, and the types of extinguishing agents needed in each case. Soda-acid, pump can, foam type, carbon dioxide, and vaporizing liquid extinguishers are brought into the classrooms and examined by the trainees. The men are further trained in the proper application of these extinguishers when fires are built in a demonstration tank outside, and the students are taught to attack and extinguish them.

A course is conducted in the basic principles of practical hydraulics, in which the trainee learns the meaning of such terms as static pressure, static head, nozzle pressure and atmospheric pressure, and their relation to fire fighting. The principles of fire streams and friction loss are next mastered, and the student learns to solve problems in pump pressure for siamese lines, wyed lines, and relaying water. He is next taught the basic principles of piston, rotary and centrifugal pumps.



Fire fighting instruction at Fort McHenry is a comprehensive course in standard operations practices at the special drill tower illustrated above, shown during pompier ladder instruction.

Having received this instruction in the classroom, the men move outside and learn to operate centrifugal type trailer pumps. The trainees get practice working as units in getting 2½-inch hose lines to the scene of an imaginary fire, applying the proper pressure at the pump, and directing the stream on the fire. A fire demonstration building is under construction at Fort McHenry now in which fires of every possible type can be started, and the men will be able actually to "smell the smoke and feel the flames." Until it is completed the trainees practice using fog and spray nozzles, foam generators and the various extinguishers on fires set in the demonstration tank.

In addition to this work every student has an opportunity to take several runs on the new fire boat at the station. Each man is allowed both to navigate the boat and to operate the monitor nozzles. The men stand fire watches while they are in the school, and have been called upon to help in operations at fires in the harbor on several occasions.

The drill tower, also, plays an important part in the training at Fort McHenry. The trainee learns to work as part of a unit in swinging a ladder into position and climbing to the top of the tower. He is taught to work with life belts on pompier ladders and the methods of carrying fire hose up the

ladders. The student is instructed in the proper knots to be used in hoisting fire equipment. He is taught fire hose rolls and carries, and the proper care of his equipment. The men are instructed in the principles of gas masks and their relation both to fire fighting operations and as protection against war gases. Every trainee has several chances to work wearing gas masks in the course of his training.

Having received thorough training in the principles of combustion and the methods of extinguishment, and having had many hours' training and practice in fire fighting operations, the trainee is given a complete and effective system to be used by the officer in charge of a fire. The complex problem confronting the officer in charge upon arriving at a fire is simplified by this system of breaking the problem down into its basic parts and giving it shape and pattern. The estimate of the situation becomes a continuous mental process in which the officer in charge must first consider the facts that exist and the probabilities that will occur as a natural sequence of these facts. Next, he must consider his own situation in respect to these facts and probabilities. Finally, he must make his decision and carry out his plan of operation. Under this system the trainee is made to understand the principles governing rescue, exposures, confining the fire, ventilation, extinguishing the fire, salvage, and overhaul.

In fire fighting, as well as in the other phases of Port Security work taught at the school, the restricted time element forbids more than the highlights of the subject to be covered. The officers in charge of the school realize this and do not pretend to turn out thoroughly trained firemen and policemen. But it is their aim to give the trainees a background of the basic knowledge and understanding of the problems they will face in port security work, and a practical idea of the manner in which to confront them successfully.

Fire Inspection.

By Robert S. Moulton.

People whose primary responsibility is in the operation of buildings, whether for manufacturing, sales, storage, instruction or anything else, have their thought necessarily concentrated upon their main job. Fire protection is secondary. To get real results in fire prevention we must eventually so educate the public that every building occupant will have fire prevention in his subconscious mind. But for the present we have to depend very largely upon the man whose main job is fire prevention and fire protection; the fire department, the fire chief, the building inspector, the insurance man, or the fire prevention inspector employed by private industry. The man whose main job is fire prevention can be expected to see these things and to act upon them; he serves as eyes and conscience for the building occupant.

Inspection to detect and correct fire hazards, to determine the adequacy and condition of fire extinguishing equipment, to pass upon building construction features pertaining to fire safety and to cover the many other factors in a complete fire protection program is of utmost importance in reducing loss of life and property by fire. No inspection, however, is any better than the man who makes it, and unless the personnel is properly qualified, inspection can be worse than useless. To command respect and secure the coöperation of the property owner, which is far more effective than any form of compulsion, the inspector must be an expert in fire matters, having an understanding of fundamental principles as well as knowing specific rules. He must be able to understand the problems and point of view of the property owner, so that fire-safety measures can be applied to the individual property with the minimum of inconvenience and expense consistent with securing the desired results.

Fire protection engineering inspection by insurance organizations is for the most part on a high plane; economic factors naturally operate to produce a favorable result. But this is not so in the field of municipal fire inspection, with some notable exceptions.

The enforcement of building and fire prevention laws in the majority of American cities has been delegated to political appointees incompetent to administer such technical legislation. Even where scrupulously honest, just because a man is somebody's brother-in-law, this does not qualify him to enforce the building laws, and a fireman who has had 20 years' experience in carrying hose and raising ladders is not necessarily qualified to pass upon the fire hazards of modern industrial equipment or to make tests on flame-proofing chemicals.

The jobs of building and fire inspection should both be considered as of a professional character to be filled by technically trained men with pay sufficient to attract professional engineers, men above petty graft.

Fire tragedies like the Cocoanut Grove will in all probability continue from time to time in American cities until we raise the caliber of enforcement of building and fire laws to a high professional level with positions filled by qualified engineers, protected by suitable civil service requirements.

This statement is not intended to suggest that only college graduates can make inspections, for experience and study can produce fire protection engineering ability even better than the college or technical school. But the enforcement of building and fire laws generally must in some way be brought to the professional engineering level. There are already a few cities in the United States where the municipal inspection forces are headed by high grade men meeting this standard, but they are very much in the minority.

The National Fire Protection Association has for many years through its field engineering service advocated the establishment of fire prevention bureaus in fire departments. Prior to this N.F.P.A. activity most fire departments were concerned only with fighting fires after they started. Today most of the larger cities have fire prevention bureaus and much good work has been done, but in very few places is the inspection on a technical, professional level. Fire chiefs who fully recognize the importance of competent inspection cannot secure results when through political interference they find the ranks of the fire prevention bureau filled with the men who are unfit physically or mentally for active fire fighting duty.

Twenty-five years ago municipal fire budgets were practically 100 per cent for fire fighting and nothing for fire prevention. Now the expenditure for fire prevention is probably 1 or 2 per cent of the total on a national basis. The fallacy of such small attention to fire prevention is clearly demonstrated by the Cocoanut Grove fire. In this case the fire department was already within a few yards of the building when the fire started, but in spite of their best efforts they were largely powerless to rescue the trapped victims.

An expenditure sufficient to secure really competent enforcement of building and fire laws in American cities would save many lives and would in the long run also save money in various ways for citizens.

Consolidation of Inspectional Services.

By L. P. Cookingham,
City Manager, Kansas City, Missouri.

Municipal inspectional services are as important to the health, safety, and economic well-being of a community as the services of the police and fire departments. A list of the services performed by the inspectional employees in any city indicates that many departments are administering regulatory activities and that practically every section of the city is visited daily by one, two, or more city employees. Many inspectors visit homes of citizens, business establishments, or buildings being constructed to see that some ordinance or regulation of the city is complied with. The municipal administrator is interested in determining in his own city how and where inspectional services best fit into the organization, how adequate supervision and control can be provided, and how standards can be developed.

There are three groups of regulatory inspectional services undertaken by cities: (1) those relating primarily to food, milk, housing, and to some extent sanitation, all of which generally are controlled by the health department; (2) routine and technical inspections in preventing and fighting fires, made by the fire department; and (3) all other municipal inspections—safety engineering inspectional work (buildings, electrical, plumbing, elevators, boilers, signs, etc.), weights and measures inspection, smoke inspection, and other miscellaneous regulatory inspections.

Many of the inspections in the third group have some significance for health and for fire prevention, and the methods used are somewhat similar. But the essential engineering nature of the inspections in the last group and also the fact that most of these ordinarily come within the scope of the public works department, indicate that consolidation of these services would have many advantages. Such unification should result in more effective coöperation with the inspectional work of the health and fire departments.

Outline of Steps Taken.

The situation in the inspectional services in Kansas City, Missouri, two years ago, probably was not unlike that in other cities. There was in the public works department a separate division for each of the following: buildings and signs, plumbing, electric, smoke, boilers, elevators, weights and measures, gasoline pumps and gas meters Each of these eight units was headed by a chief inspector who was responsible to the director of public works. But this official

EDITOR'S NOTE: This article is abstracted from "Public Management" Magazine, published by The International City Managers' Association. It is presented as representing the views of a distinguished municipal administrator. The idea of consolidation of inspectional services is debatable. Students of municipal fire administration recognize that there are some practical difficulties in the way of successful operation of such a plan.

also had nine other division heads reporting to him, or a total of 17—too many to supervise properly. Offices of the eight inspectional units were scattered over three different floors of the 30-story city hall. The chief inspector of each division determined administrative policy and permitted variations from code provisions. Each unit had its own clerical staff, files, and telephones.

A citizen who sought to apply for a permit often found it necessary to go to three different offices, and no two of the eight units followed the same procedures. Since there was no coördination, as many as three inspectors working separately could visit the same building on the same day, each without knowing that the other had been there unless an irate contractor complained. Lack of coördination also resulted in spotty enforcement and dissatisfaction among the inspectors themselves as well as among building contractors and owners.

There was a clear need for a simplified organization, and this could be achieved only by combining all eight inspectional services under one head. The first step was to review all codes and ordinances relating to building and safety inspectional activities with the thought of bringing them up to date. Because of the similarity between boiler and smoke inspectional work these two offices were combined as the first step in the reorganization plan. The success of this consolidation made it easy for the city to bring together recently all eight units in a division of inspections and permits, with the chief inspector of each group reporting to a commissioner, who in turn is responsible to the director of public works. The various offices were moved to one floor in the city hall best suited for counter space, vault space, and office arrangement. An office is provided for each group of inspectors—electrical, plumbing, smoke, etc. Staff meetings are held regularly by each group and the chief inspectors meet with the commissioner to coördinate their work.

All groups now have the same clerical staff, a single public counter, and the same employees issue all types of permits and handle complaints. A chief clerk supervises the work of the clerks in issuing permits, handling filing, complaints, and clerical work.

Each chief inspector assists with the office work at the beginning of each day and interviews contractors and others who have business with him. The chief inspector also prepares a weekly work program for each inspector in his group, and these work schedules are revised, if necessary, toward the end of the week to require a full week's work from each inspector. Work assignments were formerly issued each morning, with the result that many inspectors would complete their work by noon or early in the afternoon and return to the office or go to their homes. The chief inspectors are now required to spend a large part of their time in the field.

Each inspector reports fully on his day's work so that the commissioner can determine the volume of work and the time required for various types of inspection. The daily report also provides information necessary to maintain a complete work history on each building or other project for which a permit

has been issued. This information on the inspector's daily report is transferred by the clerical staff to the permit file. Later on certain district inspectors will report to the city hall office only two or three times a week instead of daily.

Administrative policy for all inspectional work in this new division is determined by the commissioner of buildings and inspections with the approval of the director of public works and the city manager. It has been found possible to train a good building inspector to handle electrical and plumbing inspections of the more simple types, leaving the more intricate jobs for the specialized men. This step has resulted in reducing to a minimum the number of different inspectors required to visit buildings and in cutting auto mileage considerably.

The reorganization has resulted in eliminating five inspectors and four clerks, thus effecting a saving of at least $12,000 a year. There are now 26 inspectors and seven clerks—a total of 33 employees, as compared to 42 before the reorganization.

Fire Department Organization.

By A. N. G. Firebrace,
Commander, R.N. (R't'd), C.B.E.
Chief of Staff and Inspector in Chief, British National Fire Service.

During this war I have frequently heard people say, "He is a good fire fighter but no organizer." The comment is often not fair. In pre-war days many fire chief officers, in addition to carrying out their ordinary duties, designed a war organization, recruited and trained large numbers of auxiliary firemen and were not allowed so much as a girl secretary or the use of a typewriter. No one can organize well on a standard as low as that.

Every senior fire officer, man or woman, and certainly every junior officer who hopes for advancement, must learn to be a good organizer, expert in management. It is part of his job and is more important than ever with the big divisional and fire force commands that now exist.

A dictionary definition of "to organize" is "to systematize; to get into working order." What do we mean by creating an organization? I would say that it is the designing of a smooth-running machine to be worked by intelligent human beings. This machine must be able to do a number of things.

(a) It must be capable of producing efficiency in the system which it controls.

(b) It must enable all the people concerned to work together at a steady pace without friction, duplication or overwork.

(c) It must be economical in man power, effort and cost.

(d) It must be readily adaptable should conditions alter.

(e) It must be flexible, and able to expand or contract with the volume of work.

This article has been abstracted from the "Quarterly" of the Institution of Fire Engineers, July-September, 1942.

Staff.

For an efficient organization a good staff and good heads of sections or departments are necessary. Care in selection is therefore imperative.

Take infinite pains to get the right man, with the qualifications for the particular post to be filled. See if you can cultivate that valuable faculty of being able to judge a man's character accurately. Most people can estimate a man's capabilities after serving with him for some months, but often one must choose one's staff with very inadequate opportunities for studying them.

The selection board is, for want of a better way, suitable for getting hold of the right type of staff officer, for then you see a number of individuals, one after the other, and you can compare them one against the other. Of course we all make mistakes at selection boards; the best general is the one who makes the *fewest* mistakes. I have found it helpful at a selection board to place each candidate as he is seen in order of merit with those already seen. This assists a rapid summing up at the end of the sitting.

In choosing a staff, choose men of easy temperament; difficult men, however brilliant, don't fit in well, for a staff must work as a team, and the chances of friction and jealousy must be minimized. A brilliant individualist is often better in an executive job on his own. Under no circumstances choose "yes-men." Choose men who will stand up to you and who are not frightened of you, but who, once you have come to a decision—possibly against their advice—will accept that decision gracefully and work loyally in accordance with it. "Yes-men" will let you down. More robust mentalities prevent you from making mistakes—and that is what every senior officer needs from his staff. All really big men are a bit obstinate and have a will of their own, otherwise they would never get their policy adopted.

Staff officers must have imagination, because they are so often given some new problem. It may be an idea—just a thought only—and they must produce the application of this idea in good, plain English. They must have the critical faculty. They should be able to improve every proposal that comes to them, and make some contribution to every plan or project. They should be able to spot mistakes and ambiguity of language, and must try to see everything they write from the point of view of the man who is going to read it. In other words, a good staff must be made up of men with ideas, men who are never satisfied with things as they are, but are always on the lookout for an opportunity to improve the organization.

An indifferent senior officer may sometimes be able to produce efficiency if he has a good enough staff, but the best senior officer living cannot produce first-class results if he is handicapped by an inferior staff.

The good fire staff officer is a rarity, and when found is often kept too long on the staff. No one should stay there more than two years or so, although in war time, under such conditions as the present, when we are creating a new

organization, we cannot always adhere to our principles. A good staff officer *must* know the practical executive side of his profession, and that can only be learned by doing it—by fighting fires and not watching them. One must not always be the teacher. One must have adequate spells of being taught and guided. But don't think that it is not a good thing to get on the staff. It is. It brings you to the direct notice of senior officers who may one day have to judge you for promotion, it widens your experience, and generally should help to develop some of the characteristics which are essential for a first-class senior officer.

Treatment of Staff.

You must be careful to give equal consideration to all your staff, but at the same time remember that every officer, whether staff or executive, needs different handling. General Wavell in his lectures tells us that Napoleon treated all his generals differently. To some he gave their head; others he held on a very tight rein.

Be considerate of your staff. Don't ask them for endless statistics "by 9 A.M. tomorrow," which you will not have time to look at until several days later. Bear in mind the great labor that is sometimes involved in getting just one figure that you think you need.

Here is a quotation from an article by an eminent General Post Office Controller. He says, speaking of the head of a department:

> "The success or failure of the head of a department will, in a great degree, be determined by the loyalty of his staff—such loyalty as is felt by the staff to be mutual, and springs from a genuine recognition that their chief is loyal to them, and that he and they between them make up one living whole—which is warmed with encouragement or chilled with disappointment as one. So the head of a department will stand by any member of his staff who, for any reason, is under a cloud. He will be 'advocate' and 'best friend' before he is 'judge.' and in any success achieved or commendation earned by the subordinate he will feel a gratification akin to that which he would feel for himself."

You certainly cannot always take the advice of your staff, and they must realize this. Make your own mistakes and tell your staff at the time that you propose to risk doing this. On the other hand, take care your staff do not get the idea that you do not value their advice or suggestions or they may be apt to withhold them from you. When an officer lays a proposal before you or takes the trouble to write a paper on some subject, be sure that he feels his ideas have been thoroughly considered, not brushed to one side. If you do not agree with his ideas, try and go over them with him and give him your reasons. He will do better next time.

Take care that you are not jealous of your juniors. Let them have as much credit as possible for their work. I have remembered for the last twenty or thirty years the following saying by Lord Cromer, the maker of modern Egypt. "Throughout your life you will achieve more good if you are completely careless as to whether or not you get the credit for your labours."

Delegation.

Webster's dictionary says that to delegate means "to entrust to the care or management of another." It might also be described as the art of ridding oneself of details while still keeping a grasp on essentials. Speaking of detail, it is good to rid yourself of detail in one sense, but it is a great advantage if you can carry essential detail in your mind, for it gives you confidence when talking to seniors not to have to refer continually to your juniors for information.

Delegation is the art of forcing work down to the lowest level at which it can be done efficiently. The motto to follow is: "Never do anything yourself which your juniors can do equally well." You will be surprised how much they can do. Try them!

There are some senior officers today who are so incapable of delegating that they actually open personally the envelopes of their morning mail. No wonder they are overworked, snowed under with paper, and in consequence remain too long in their offices when they should be out and about visiting stations, supervising exercises, and getting to know their subordinates.

Good delegation can be summed up as "clear direction at the top—obedience and intelligent coöperation below."

Delegation sometimes makes for delays. You may delegate a piece of work to a junior and he may produce nothing of value. Then there is a tendency to feel that you might just as well have done the job yourself at the start. But when work is urgent there is often nothing to prevent your giving the job to a junior and doing it yourself at the same time, for he may very probably produce some original angles on the problem which have escaped you.

When you give a problem to someone don't tell him exactly *how* he is to do it. Outline in general terms what you want and leave him to apply his mind as to the best way to do it.

Sir Ian Hamilton said in one of his books, "The higher up the ladder you climb, the less you have to do, provided that—(a) you have some courage; (b) you have some trust."

I think he means that you must have courage to allow your juniors to make some mistakes—mistakes for which *you* may have to take the responsibility and blame. Unless you trust you will never delegate. The art of the delegator is to know whom to trust and to what extent. And if you feel that you cannot trust your staff it may be time to change them.

If a man is not doing well in one job, try him out at another which you think will suit him better—give him another officer under whom to work. That may make all the difference.

One way of deciding whether to give a junior a free hand in any matter is to consider what will be the effect if he makes a mistake or comes to a wrong decision. If the results will not be serious then that is an argument for leaving

the matter to the junior, thus giving yourself time for things which are important.

Your juniors should receive specific, well-defined references and should only come to you when they are in difficulty or doubt. Let them provide you with a copy of their more important letters and memoranda so that you keep track of what is going on. If they are far off the line there will be time to step in and recover the situation.

To Centralize or Decentralize?

To decentralize has been defined as "to divide and to distribute." In designing some required organization the question frequently arises—shall it be centralized or decentralized? It would be well at this stage to be sure that we understand some of the principles involved.

In order to decide whether to centralize or decentralize work which must be done, a number of factors must be weighed up; for example:

(1) Geographical considerations. One tailor's shop for a large, scattered area would be wrong, because of the time so many men would waste in traveling, quite apart from the expenditure of petrol that might be involved.

(2) The standard of efficiency required. One tailor's shop might produce the most efficient workmanship and be more easily supervised. Yet a lower standard of efficiency might be accepted and prove sufficient under the circumstances.

(3) The relative cost in staff between the centralized and decentralized proposals must be assessed. The cheapest is not necessarily the one to follow, but the figures will be a guide.

(4) The volume of the work may influence the decision; for example, no single garage that we are likely to be able to acquire would carry all the repairs that are thrown up by an important Fire Force.

I have said enough to show that each problem must be studied separately. To centralize will often produce a higher standard, but if distances are great it will make for great delays and expense. In these days, too, the war factor must also be borne in mind—it would be dangerous to centralize stores or records near a target area—dispersal is the correct policy.

Standardization.

The question of whether to standardize or to allow local preference is an interesting one. It is sometimes said that "standardization spells stagnation." On the other side, it may be said that non-standardization spells chaos. We cannot, however, generalize—some things must be standardized, while it would be unwise to bring others under rigid regimentation.

As an example of the requirement for rigid standardization I would place the executive orders to be given at drills—we must all talk the same language on the fire ground. On the other hand, I would suggest that standardization is, for instance, neither necessary nor desirable in conducting an exercise. If there is rigidity you may find that the organization is planned to meet only the special conditions established and not any deviltry that the enemy may be up to.

Summary.

(a) Don't be a bottleneck by insisting upon every paper for which you are responsible passing through your hands. Give your juniors as free a hand as possible to deal with higher officers.

(b) Some officers dislike their subordinates being closely in touch with officers in other departments or sections. Such distrust prevents the quick and smooth transaction of business. You should encourage freedom of contact between your officers and those of other departments, but take care that you know what is going on.

(c) Some officers keep all the information to themselves and won't let their juniors have access to papers. The result is that when the senior officer is sick or takes a day's leave and somebody wants to know something, there is trouble and the junior may suffer for the errors of the senior.

(d) Don't underrate the difficulties of those at levels above you. You cannot know the reason for the exasperating delays and shortages that occur. We are all of us tempted to think that our methods, if adopted, would produce better results, but it might not be so. *Or* we might do better in some directions but not better as a whole.

(e) Don't encourage the staff officer who "keeps everything in his head." He will be on leave when the crisis arrives and his subordinates will be unable to step into his place. Try to achieve the ideal that your department could, if necessary, work as well without you or any other member of your staff as it would were you available.

(f) It is highly important that the work and responsibility of staff officers should be defined, so that there is no overlapping or dispute as to whose job some particular work is. Great unhappiness and inefficiency in an organization are often caused by loose or complete lack of definition of duties, and when one of the parties has a difficult temperament the other party who desires to keep the peace has a most uncomfortable time.

(g) In allocating work try to divide it into large blocks; avoid giving a little bit here and a little bit there. If you do there will constantly be work coming forward which falls between two references and which must therefore be dealt with by two people, or there may be doubt as to which section the work belongs.

(h) Within limits every officer must be allowed to do a job in his own way. We do not want moulded robots. We want men of character, personality and initiative. The essential thing is the production of good results.

(i) I am a believer in giving as many officers as possible personal copies of orders. There is then no excuse for their not knowing them. It is not enough to make an officer initial a paper and then expect him to remember its contents forever.

(j) A moderately good memorandum got out on the first of January is better than a perfect article which struggles painfully out on the following first of June.

(k) I have learned at the Home Office how difficult it is to get out an instruction, because it has to be worded so that it will suit big cities, small towns and rural areas. Everyone who reads an instruction assumes that it has been written with him particularly and solely in mind.

(l) In going forward on a big piece of work it is always sound to make a target at which to aim—to produce so many thousands of gallons of static water per week—to complete a new station within so many days—to get the personnel records done by such and such a date—and so on.

(m) If you have an important paper, lecture or report to write, spend time in designing it—in other words, organize it, write headings for the paragraphs and make brief notes of what you intend to say under those headings. Don't start straight away writing the report.

(n) A follow-up system is very necessary. An officer may hold a paper for a week or more because he does not know how to handle it. Day after day this awkward paper comes to the top of his "In" basket, and sinks again with the following morning's work. Some papers are very difficult for juniors to handle, and they should take them to their seniors for guidance. If a piece of work is being delayed, give instructions that a weekly progress report is to be made and submitted to you. This is a species of follow-up and is very necessary if you are to show drive and are determined to push the work along. Further, it has the great advantage that it keeps you closely in touch with how things are going.

(o) If you are going to have a conference it pays to put some preliminary work into it. Get out a good agenda, with numbered items. On those which are appropriate have papers written in order to stimulate discussion and to get people thinking *before* they attend the conference. A bad draft is far better than none at all. Don't, of course, keep the minutes of the conference yourself, but take good care to see that they are circulated afterwards without delay before the whole matter is stale.

(p) Look through your "In" basket daily. Clear the work, if you can; at all events know what is there; make up your mind whatever happens to get up to date once a week.

(q) One very important office is the Registry and Filing Section, the office which guards the files and keeps track of papers—so don't put your least intelligent personnel there. If papers cannot be found it is exasperating and tempers get frayed. In some offices more time is spent in looking for papers than in writing them. There should usually be one Registry for the whole office; each section should not maintain its own.

(r) And, finally, here is a remark once made to me by Sir George Gater, until recently the Permanent Secretary to the Ministry of Home Security:

"With perfect good will *any* organization will work—without it *no* organization will."

Pontiac Department Store Fire.

Report by Michigan Inspection Bureau.
(Member N.F.P.A.).

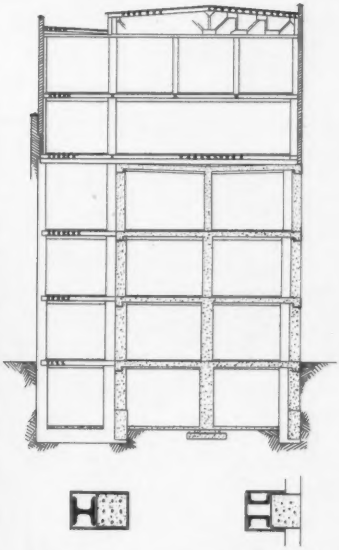
A fire in the Chase Department Store, Pontiac, Michigan, November 16, 1942, furnished a very interesting example of the importance of building construction with adequate fire resistance to withstand the burning out of the contents. This building, originally a reinforced concrete structure, had been enlarged and increased in height by the addition of light steel construction protected with metal lath and plaster. A large part of the new construction collapsed, while the original concrete structure was not damaged. This steel construction with metal lath and plaster protection would probably have been adequate to withstand the effects of fire in a relatively light concentration of combustible contents such as might be found in a dwelling, but did not withstand the severe effects of fire in the heavy concentration of combustible material of a mercantile occupancy.

The fire, cause unknown, originated on the top floor of this five-story structure and resulted in an almost complete loss to the fourth and fifth floors, including their contents, and to the contents of the first floor and basement. There was no loss by fire to either building or contents on the second and third floors. The preliminary estimate of loss on the building is $185,000 and on contents, $350,000, a total of $535,000. The estimated building value was $275,000; the total value of contents was estimated at $385,000.

Description.

The original building 60 ft. by 142 ft., erected about twenty-five years ago, was three stories and basement, and entirely of reinforced concrete construction. In 1938 a section 20 feet by 142 feet was added on the north, five stories high with basement, and a fourth and fifth floor were added to the original building. The floors of this addition were two inches of concrete on steel joists protected directly underneath by a metal lath and plaster ceiling. The roof and fifth floor over the original section were supported over a 60-foot span by columns which extended through the old section. The roof was composition, on one-inch boards on unprotected flat truss from which the fifth floor was suspended on metal angles, resulting in a fourth floor over the old building with columns only at the sides. (For details see cross-section.) Supporting columns of the new construction were protected by metal lath and plaster, but the steel work in the roof and fifth floor was unprotected. Vertical openings consisted of an enclosed stairway in the rear of the new section; openings at each floor protected by fire doors; a large open stairway; and two enclosed elevator shafts in the rear of the old building, the openings of which were also

The front of the building, showing the character of the damage.



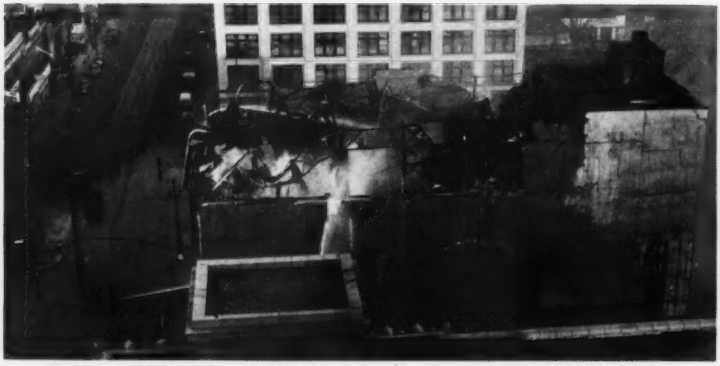
Cross-sectional diagram of the building, showing the original concrete structure and steel frame addition.

protected. All these extended from the basement to the fifth floor. In addition there was an open stairway near the front entrance from basement to first floor.

All floors were used for sales except the fifth, which was a stock room. The building was equipped with an approved and properly distributed system of ten watchman's portable clock stations, with hourly rounds from 7:00 P.M. to 6:00 A.M.

Story of the Fire.

The alarm was received over the telephone at 3:02 A.M. from an unknown source, which resulted in the response of three 750 g.p.m. pumpers, a service truck and the assistant chief with sixteen firemen; most of this first alarm response equipment is housed within three blocks of the building. The assistant chief upon arrival, seeing smoke pouring from the fifth floor front, pulled a second alarm from a box on the corner. A citizen standing at the box advised the assistant chief that he had been there for some time, endeavoring to send in an alarm, but did not know how to operate the fire alarm box. The fire department was admitted through the front door by the watchman, who did not realize that there was a fire. It was determined afterward that this watchman may not have been on the fifth floor for over an hour, but this could not be checked as the clock and record could not be located.



Ruins of the fourth and fifth floors as seen from an adjoining building.

The chief and five men with a 1000 g.p.m. pumper responded to the second alarm. An additional alarm by the chief brought another 1000 g.p.m. pumper, five men and a reserve hose truck. Almost the entire off-shift of 32 men responded. Due to inadequate ladder equipment it was impossible to ventilate the front of the fifth floor or attack the fire at this point. Three 2½-inch hose lines were taken to the fifth floor up the open stairs at the rear, but partitions on this floor as well as the promiscuous piling of stock seriously handicapped the fire department. In twenty to thirty minutes after a hose line had been taken to the roof through the enclosed stair shaft, the roof and fifth floor above the old section, with the exception of the two rear bays, collapsed on to the floor of the fourth story. The entire fifth floor front wall along with burning stock fell outward to the sidewalk, part of it dropping to the basement area through light wells. Heat from the burning débris broke the first floor front windows, which resulted in a draft toward the openings in the rear. This, together with the burning embers in the basement and the open stairs, involved the basement and first floor. Fire at this point was attacked by hand lines from both front and rear and by a deluge set at the front. The fire on the fourth floor was extinguished by hose lines in the rear of this floor, from the roof of the building on the south, and from the street on the north. At 7:00 A.M. the fire was under control and the last company returned to quarters at 6:35 P.M. Water supply from the distribution system was adequate at all times.

Fire-Retardant Treatments for Wood.

By G. C. McNaughton.

From ancient times, man has associated wood with fire. He has become imbued with a wood-fire consciousness acquired by centuries of personal experience. It is, therefore, not surprising that mention of "fireproofing" treatments for wood should be received with enthusiasm by some and with intense skepticism by others. A better understanding of the unvarnished facts should help to reconcile these widely divergent attitudes. Possibly the first step in reaching this understanding would be to avoid the use of the all-inclusive term "fireproof" and select instead one which describes a specific performance resulting from the treatment. Even this may not be a simple thing to do.

There are two distinct aspects of fire retardation to be considered. One is fire spread, which relates to the freedom and rapidity with which fire spreads over a surface that has been ignited. The other may be called fire penetration and relates to the tendency of fire to burn through a door, wall, or other obstruction in its path.

The manner in which the spread of flames is retarded and that in which penetration of fire is resisted are so closely associated in fires of structures that consideration of each separately is difficult under such circumstances. Both aspects will depend upon the specific form and arrangement of the materials involved in the fire and also on the character of the igniting fire. In testing a material of construction, however, where the character of the fire application may be controlled, distinction between the two phases of fire performance is possible and terms "fire retarding" or "fire retardant" may be applied to treatments which limit flaming performance. With this brief explanatory background, a description of the fire-retarding treatments may be more intelligible.

Two general methods are available for reducing the flaming characteristics of wood by the use of fire-retarding chemicals. One method consists of an impregnation treatment which deposits water-borne chemicals within the wood. Many chemicals exhibit fire-retarding properties, but because of cost limitations or various objectionable characteristics, comparatively few are considered practical. These are usually combined in various proportions in known treating formulas, and include mono and dibasic ammonium phosphates, ammonium sulphate, borax, boric acid, and zinc chloride among the most familiar chemicals. Penetration of the treating solution into the wood is usually ob-

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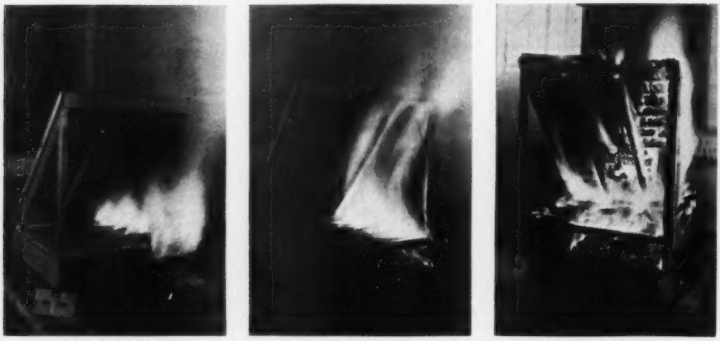


At 1 minute. At 6 minutes. At 20 minutes.

Fig. 1. Performance of a borax-linseed oil base fire-retarding paint in a conventional wood attic section, when exposed to a training-type 1-lb. magnesium bomb placed in the extreme corner. Spread of flame was delayed, but the cracks between floor-boards allowed molten metal to run through and ignite the unpainted surfaces below.

tained by vacuum-pressure methods similar to those used in the wood-preserving industry, and the operation is controlled to secure a predetermined absorption of solution. The important considerations, however, are the depth of penetration and the amount of chemical deposited in the wood, rather than the details of the treating method. Subsequent to treatment, the material must usually be dried before use.

The other method of controlling flaming characteristics of wood is the application of suitable coatings to the wood surfaces. The coatings may be of the nature of oil- or water-base paint preparations in which fire-retarding chemicals have been incorporated, or they may be of compositions requiring much thicker applications whose effectiveness depends mainly on their heat insulating properties. Only the paint-type coatings will be considered in the following discussion.

The maximum benefit that can be derived from these treatments is a reduction in the flammability of the wood to an extent that it will not contribute fuel to a fire already started. If the spread of flame from an incipient fire can be retarded or prevented, and if flaming can be made to decrease or cease after the igniting source has been removed, the main purpose of the treatment will have been achieved.

Comparison of Fire-Retarding Paints and Impregnation Treatments.

Effectiveness.

Under sustained, severe fire exposure, there are no impregnation treatments or fire-retarding paints that will give complete protection. Good impregnation treatments are more generally dependable than paint coatings, but for

At 1 minute. At 5 minutes. At 25 minutes.

Fig. 2. Showing the performance of an untreated wood attic section exposed to a 3.25 lb. magnesium bomb placed in the extreme corner. A double thickness of ¾-inch flooring prevented the molten metal from igniting surfaces beneath the floor. Untreated surfaces above the floor contributed fuel readily.

controlling the spread of small fires a good fire-retarding paint can be practically as effective as an impregnation treatment.

A certain amount of favorable experience in actual fires has been built up around impregnated material used for interior trim and scaffolding. There may have been similar favorable experiences with fire-retardant coatings, but actual records seem unavailable.

The lack of a satisfactory background of use experience, extravagant claims by irresponsible promoters, lack of permanence, the uncertainty of proper application after the paint leaves the manufacturer, and failure of the user to take into account construction features that contribute to fire hazard may be among the reasons why authorities have not reacted favorably to fire-retarding paints in the past.

The ultimate fire performance of a specific wood structure is more likely to be affected by details of design when a fire-retarding paint is used than when resort is made to impregnated wood. One reason for this is that the paint is ordinarily applied to but one surface of the wood. Glowing, once it is established by the fire, is more apt to persist in the untreated wood beneath painted surfaces than in properly impregnated wood. Even though the spread of fire is prevented on the painted surface, ignition of an opposite unpainted side by transmitted heat or some other cause may permit the fire to get completely out of control. This condition would occur when an incendiary bomb of the magnesium-thermit type comes to rest on spaced boards of an attic floor so that the molten metal can run through the cracks between the boards (Fig. 1). The fact that the fire-retarding chemicals have penetrated all surfaces to an appreciable extent removes some of the objections that apply to surface coatings.

At 1 minute. At 5 minutes. At 45 minutes.

Fig. 3. A wood attic section painted with a moderate application of a water-base alginate paint and exposed to the same test conditions shown in Fig. 2. The coating greatly retarded, but was not heavy enough to prevent the spread of fire from a 3.25 lb. magnesium bomb.

The shattering, by a demolition bomb or otherwise, of painted wood or a large impregnated timber would expose considerable areas of unprotected surfaces that would contribute to any fire that might be started. The amount of untreated wood exposed in a large impregnated timber would be less, however, than with coated timbers. It would be still less with smaller sizes of impregnated timbers and lumber, because the amount of unpenetrated wood in the interior of impregnated material decreases with size and, with thin lumber, 100 per cent penetration may be obtained.

When there is a reasonable expectancy that integrity of surfaces will be maintained, and the structure possesses an appreciable amount of resistance to the penetration of fire, the use of coatings is definitely worth while. Good coatings can greatly retard the spread of fire from small incendiary bombs or other sources of fire and thus increase the time for the discovery of the fire and for getting control apparatus into action. (Compare Figs. 2 and 3.) Superior coatings or impregnated wood may even permit small fires to burn out unattended (Figs. 4 and 5), while the same fire in natural wood can spread rapidly (Fig. 2).

The fire-test performance obtained from lumber that has been impregnated with fire-retarding solutions is closely related to the amount of dry fire-retarding chemical retained in the wood. Fire-retardant lumber may be purchased either on the basis of the amount of chemical retained per unit of wood volume, or on the basis of the fire performance of representative samples of the treated material.[1]

[1] Proposed Federal Specification for Pressure Impregnation of Structural Lumber and Timber with Fire Retarding Chemicals; Recommended Treating Practice.
Proposed Federal Specification for Fire-Retardant Chemicals for Pressure Impregnation of Structural Lumber and Timber.

At 1 minute. At 5 minutes. At 30 minutes.

Fig. 4. A wood attic section similar to that shown in Fig. 3, but with a heavier application of the water-base alginate paint, and under a similar bomb exposure. In this case the heavier coating completely stopped the spread of fire.

The fire-test performance obtained from wood coated with a good fire-retarding paint is related to the amount or thickness of application. Usually a much greater thickness is required than is customary with ordinary decorative paint coatings. At the present time there are no generally accepted specifications for the composition of fire-retarding paints; and, while various ranges in effectiveness have been reported, there are no generally accepted standards of test performance.[2]

Application.

Pressure impregnation treatments obviously are unsuited for existing structures. For best results in structures to be built the lumber and timbers should be cut to finished dimensions before treatment and should not be cut or surfaced after treatment. Easily treated lumber of small cross section, however, may be so completely impregnated that some cutting after treatment can be permitted. The absorptions and penetrations obtainable vary considerably with different species of wood and between sapwood and heartwood of the same species. Some species are exceedingly difficult to treat, and considerable skill and careful supervision are required to insure an acceptable product with them.

Fire-retarding paints, on the other hand, may be applied to completed structures by brushing or spraying, and to all species of wood with equal facility. The application of coatings is simple and requires only moderate equipment, skill, and supervision. Inadequate application can be corrected when discovered, and the coatings usually can be renewed as often as required.

With suitable modification, both impregnations and paints may be applied

[2] U. S. Forest Products Laboratory mimeograph No. 1280, "Fire-Retarding Coatings," revised September, 1942.

At ½ minute. At 5 minutes. At 42 minutes.

Fig. 5. An attic section in which the rafters, roof-boards, inside of end-wall, and top ply of flooring were impregnated for a moderate degree of fire-retardance, and exposed to a 3.25 lb. magnesium bomb. The treatment completely stopped the spread of fire on exposed surfaces, but the untreated subfloor became ignited by the excessive heat transmitted through the flooring.

to plywood and other forms of cellulosic material. With plywood, it is possible to impregnate the veneers before gluing, but such procedure requires the use of a glue that will not be affected adversely by the fire-retarding chemicals in the veneers. This is not always easy.

Cost.

Besides the actual cost of the fire-retardant chemicals used, impregnated wood must bear the overhead of a treating plant, technical control and inspection costs, rehandling and redrying costs, and probably additional transportation charges. The cost of impregnation will vary considerably with the kind of wood, the quantity required, the purpose for which it will be used, the thoroughness of impregnation, the nature of the chemicals used, and the weight of chemical absorbed per unit of wood. Actual cost figures are likely to be between $30 and $50 per thousand board feet over the cost of the untreated wood, and sometimes may be higher. The fact that lumber impregnated with fire-retarding salts is very hard on ordinary machine tools is another item of increased cost when such wood must be machined. Special alloy steel tools prove an economy if machine work is extensive.

The retail cost of a gallon of fire-retarding paint could be expected to vary over a wide range, depending largely upon the type of base employed. The necessity for using thick films limits the coverage per gallon and increases the cost per unit area as compared with ordinary paint. The ultimate cost of a suitable fire-retarding coating for a unit of area, however, should usually be less than the cost of impregnating the wood.

Strength of Wood.

Paints are not inherently harmful to wood and do not penetrate it appreciably, hence there is no reason to expect that they would have an adverse effect upon the strength of the wood to which they are applied.

Little authentic information is available concerning the effect of the various fire-retardant chemicals and treating conditions upon the strength of the impregnated product. Zinc chloride is known to corrode cellulosic material when used in high concentrations and at elevated temperatures, and it is believed that the concentration of zinc chloride solutions required to impart high fire retardance to treated wood is likely to be harmful to strength. The effect may not be apparent immediately after treatment, but may increase with the age of the treated wood, particularly if the wood is used under conditions of low humidity and relatively high temperatures. Similarly, observations in reworking pine lumber impregnated with borax suggest that large amounts of this salt may tend to make the wood brittle. Other chemicals may have a corrosive effect upon metal fastenings used in constructions and require the addition of a corrosion inhibitor to the treating solution. There is also a possibility that, in wood treated with certain chemicals, high kiln-drying temperatures may produce injurious effects, although this has not been definitely established.

There have been no adverse reports concerning strength reduction in treated material in use, but on the other hand, there is no assurance that reduction in strength has not occurred in some cases. For these reasons, the purchaser of impregnated lumber should be cautious in using high concentrations of fire-retardant chemicals in timber that is to be subjected to high working stresses or whose failure would have serious consequences. In timbers whose weakening would create undue hazards, protection may be obtained by leaving the load bearing members untreated or lightly treated for decay protection and then covering them with inch lumber heavily impregnated with fire-retarding chemicals.

General Durability.

The fire-retardant properties of wood impregnated with fire-retardant chemicals should remain permanent if the material is not subjected to water exposure. On the other hand, fire-retardant paints, like ordinary paints, would need renewing at periodic intervals, according to the amount of wear or other damage to which they are exposed in use.

On account of the water-soluble nature of the fire-retarding chemicals used, neither coatings nor impregnations are well adapted to damp or wet conditions or to weather exposure, but under similar exposures to moisture, wood impregnated with fire-retarding chemicals should retain its effectiveness somewhat longer than the painted wood.

In some instances where impregnated structural material has been used in out-of-doors exposures, ordinary outside paint has been applied to retard the leaching of the chemicals by rain or other water. There is little information as to how well the paint performs in such service, or as to its effect upon the fire performance. There are indications, however, that once the paint film has become thoroughly dry and freed of combustible volatiles, it does not detract from the fire-retarding properties of the treated lumber.

The application of a suitable "waterproof" material over fire-retarding paints has been suggested as a means of adapting the latter to damp exposures, but no evidence has been made available that the scheme has been successful.

In a general way, a comparison of the two methods for improving the fire performance of wood, may be summarized as follows:

Property	Coatings	Impregnation Treatments
Effectiveness	Moderately effective	More effective and dependable than coatings.
Suitability for application	To structures already erected	To building lumber or timbers before erection.
Cost	Ordinarily less than impregnations	Relatively high.
Adverse effect on strength of wood	Probably none	Possible in some cases.
Conservation of critical materials	Small amounts used.	Substantial absorptions required.
Durability	Not permanent, but renewable	More lasting than coatings, but not renewable.

The 1942 Fire Loss.

The fire loss in the United States for the year 1942 is $314,849,000, according to a preliminary estimate by the National Board of Fire Underwriters. This total estimate is $7,508,000, or 2.3% less than the 1941 preliminary loss estimate, and shows decreased losses over 1941 in all but four months of the year.

Comparative Monthly Loss Estimates, 1940, 1941, 1942.

	1940	1941	1942
January	$36,260,650	$26,470,000	$35,565,000
February	34,410,250	26,102,000	30,819,000
March	29,788,800	31,471,000	30,505,000
April	26,657,190	29,330,000	27,960,000
May	23,446,590	25,637,000	23,233,000
June	19,506,000	24,943,000	22,410,000
July	20,322,800	23,698,000	21,000,000
August	20,722,100	24,122,000	19,680,000
September	21,198,000	24,668,000	20,443,000
October	22,091,140	30,833,000	22,621,000
November	23,449,000	23,822,000	24,144,000
December	28,617,000	31,261,000	36,469,000
Total 12 months	$306,469,520	$322,357,000	$314,849,000
Adjusted loss figures	$268,491,347	$303,895,000	

Aggregate Loss for 27 Years Is Nearly Ten and a Half Billion Dollars.

The 1942 fire loss brings the total fire waste in the United States during the past twenty-seven years up to $10,362,799,442, an annual average of $383,807,386. The following table gives the annual fire losses by years since 1916, the first year for which similar estimates were made.

1916	$258,377,952	1930	$501,980,624
1917	289,535,050	1931	451,643,866
1918	353,878,876	1932	406,885,959
1919	320,540,399	1933	271,453,189
1920	447,886,677	1934	271,197,296
1921	495,406,012	1935	235,263,401
1922	506,541,001	1936	266,659,449
1923	535,372,782	1937	254,959,423
1924	549,062,124	1938	265,591,231
1925	559,418,184	1939	274,943,000
1926	561,980,751	1940	268,491,347
1927	472,933,969	1941	303,895,000
1928	464,607,102	1942 (Est.)	314,849,000
1929	459,445,778		

NOTE. It may be noted that the final loss figures for both 1940 and 1941 are less than the preliminary loss figures for those years. It may be assumed, therefore, that the adjusted loss figure for 1942 will also be lower than the preliminary estimate.

ANNUAL CONFLAGRATION MAP of The National Fire Protection Association
Big Fires of 1942
Fort Richardson Alaska Warehouse
Seattle, Wash. Fish Pier
Vancouver, Wash. Shipyard Dormitories
Tacoma, Wash. Lumber Mill Lumber Mill
Portland, Ore. Lumber Mill Mercantiles Grocery Whse
Edmonton, Alta. Store & Office Bldg.
Lead, S.D. Mercantile & Off. Bldg.
Rockport, Calif. Lumber Mill
Geneva, Utah Steel Works
Denver, Colo. Liquor Whse Ordinance Plant
Heeney, Colo. Machine Shop
Las Vegas, Nev. Magnesium Mfr.
Los Angeles County, Calif. Forest Fire
San Diego, Calif. Warehouse
Enid, Okla. Oil Refinery
Oklahoma City, Okla. Laundry
Snyder, Tex. Cotton Oil Plant
Honey Grove, Tex. Cotton Warehouse
Abilene, Tex. Cotton Warehouse
Dallas, Tex. Exposition Bldg. Paper Products Mfr.
Wolfe City, Tex. Milling Plant
Nederland, Tex. Oil Refinery
Houston, Tex. Dept. Store
Texas City, Tex. Oil Refinery
Pritchard, Ala. Cotton Mill
Superior, Wis. Grain Elevator
Mellen, Wis. Veneer Mfr.
Janesville, Wis. Group Fire
Dubuque, Iowa Egg Products Mfr.
Jackson, Mich. Mercantiles
Freeport, Ill. Group Fire
Chicago, Ill. Warehouse
Kewanee, Ill. Conflagration
Kokomo, Ind. Pottery Mfr.
Richmond, Ind. Business Block
Tiffin, Ohio Metal Workers
Akron, Ohio Furniture Mfg.
Cincinnati, Ohio Hotel
Pontiac, Mich. Dept. Store
Cleveland, Ohio Metal Working Fur Stge.
Danville, Ill. Cereal Mill
Indianapolis, Ind. Starch Plant
Carbondale, Ill. Grocery Warehouse
Danville, Ky. Tobacco Warehouse
Hickman, Ky. Veneer Mfr.
Quebec, Que. Group Fire
Sorel, Que. Group Fire
Toronto, Ont. Tannery Stge.
Syracuse, N.Y. Motel Furnace Mfr.
Gloversville, N.Y. Glove Factory
Norwood, Mass. Tannery
Waltham, Mass. Woodworking
Woburn, Mass. Tannery
Rhode Island Fire
Boston, Mass. Night Club Mercantiles
Taunton, Mass. Silver Plant
Pawtucket, R.I. Tenant Mfg.
Fredericton, N.B. Business Block
Butler, Pa. Metal Working
Carteret, N.J. Chemical Mfr.
New Kensington, Pa. Aluminum Mfg.
Hartford, N.Y. Freighter Pier S.S. Normandie Multiple Occupancy Paper Warehouse
Lewis, Pa. College
Terryhill, Pa. Rubber Works
Washington, D.C. Hotel Under Construction
Baltimore, Md. Auto Warehouse
Burlington, N.C. Warehouse
Mt. Pleasant, S.C. Dwelling
Key West, Fla. Steam Dredge
Fires which from the best estimates of loss available exceed one-quarter million dollars each.
NATIONAL FIRE PROTECTION ASSOCIATION
60 Batterymarch Street, Boston, Mass.

Large Loss Fires, 1942.

During the year 1942 there occurred in the United States, Canada, and Alaska a total of eighty fires, each of which involved a loss of $250,000 or more. This information is based upon reports received by the N.F.P.A. Department of Fire Record. Five of these fires occurred in Canada and one in Alaska. This represents an increase of thirty-two fires, or sixty-seven per cent, over the number reported for 1941, and is thirty-three fires greater than the average for the past five years. Twenty-eight of these fires caused individual losses of $500,000 or more, including six which resulted in losses of $1,000,000 or more each. The largest fire loss of the year was the destruction of the liner *Normandie* at New York, N. Y., on February 9, 1942. Depending on the success of salvage operations the loss from this fire may reach $53,000,000, the original cost of the vessel.

A total of 512 lives were lost in these fires, 489 of them being accounted for by the Cocoanut Grove night club holocaust of November 28. This is in contrast to a total of fifty lives lost in the corresponding fires of 1941.

The following table shows the occupancies which were involved:

Warehouses	16	Piers and wharves	2
Metal workers	10	Forest and brush fires	2
Miscellaneous manufacturing	9	Building under construction	1
Lumber yards and woodworkers	7	Cotton mill	1
Group fires	7	Dwelling	1
Multiple occupancies	4	Laundry	1
Flour and feed mills	3	Night club	1
Oil refineries	3	College building	1
Hotels and dormitory	3	Chemical plant	1
Ships	3	Conflagration	1
Department stores	2	Exposition building	1

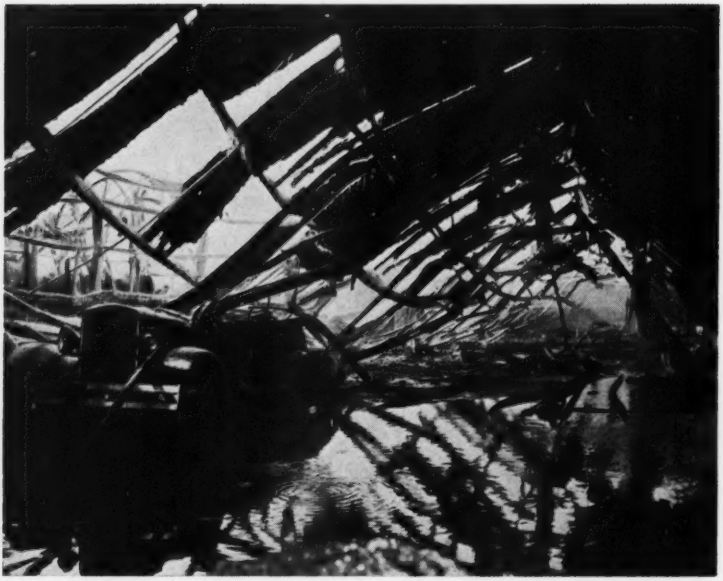
A summary of each of these fires is presented to show the factors responsible for each large loss so far as that information is available. The loss figures used are in most cases adjusted losses or authoritative estimates.

January 1, Brooklyn, N. Y. S.S. *Pocone*. Loss: $730,000.

Spontaneous heating of bunker coal was responsible for this fire which resulted in $600,000 damage to the cargo of castor and coffee beans. The burning coal heated a bulkhead, which in turn caused spontaneous heating and ignition of the castor beans. The fire was confined to the ship, the greatest loss being from water damage. Damage to ship amounted to $130,000.

January 8, New York, N. Y. Pier 83. Loss: $474,000.

Fire, originating in burlap bags filled with copra, spread with such rapidity that firemen responding to the first alarm were forced to abandon their



Acme.

Pier No. 83, North River, New York City, was destroyed on January 8, 1942, with a loss of $474,000. The pier structure, of combustible construction, was 570 feet long, without firebreaks in the pier shed or substructure and was without automatic sprinkler protection. As shown above, the hose truck of the only engine company dispatched to the first alarm was trapped by the rapid spread of the flames. Several firemen were burned before making their escape.

apparatus on the pier in order to save their lives. This five-alarm fire was not checked until the entire pier superstructure was a mass of wreckage and the pier deck and substructure were badly charred. When the fire occurred, the copra was being discharged from the steamship *Lancaster*. The flames spread to the ship's bridge, but the vessel was saved from serious damage by being towed away from the pier. The principal factors responsible for the large loss were the lack of automatic sprinkler protection, draft stops, and fire walls. The pier shed was one great area, constituting nothing more than a long large horizontal flue. Firemen were hampered by extreme cold, high wind, and the fact that the pier could be approached from only one side because of a ferry slip. Damage to the pier structure amounted to $274,000 and the loss on the contents was approximately $200,000 additional. (April, 1942, QUARTERLY, page 329.)

January 9, Chicago, Ill. Herrmann Warehouse. Loss: $697,000.

This one-story and basement brick storage warehouse was practically destroyed together with its contents, when a spark from an acetylene cutting torch fell on baled cotton. The sprinkler system was shut off for repairs and a quick fire resulted. Firemen found the fire beyond control upon arrival and

Chicago Times.

The Herrmann Warehouse in Chicago was destroyed on January 9, 1942, with a loss of $697,000. A spark from an acetylene torch used to weld gravity tank supports fell on baled cotton, starting a flash fire. The sprinkler system had been shut off for repairs and the fire was beyond control when firemen arrived.

consequently devoted their efforts to preventing flames from reaching adjacent structures. The aged watchman was burned to death when he reëntered the burning building. Estimates place the building loss at $107,000, while the loss to contents approximated $576,000. Indirect losses were about $14,000.

January 10, Superior, Wis. Grain Elevator. Loss: $1,750,000.

Mechanical failure in a leg of the Great Northern Grain Elevator "X" resulted in a fire with ensuing violent grain dust explosions which damaged structural members and disrupted the sprinkler system. The frame elevator was destroyed, together with nearly all the contents, which consisted of approximately 1,250,000 bushels of grain.

January 15, Syracuse, N. Y. Lennox Furnace Company. Loss: $427,000.

Fire of undetermined origin destroyed two main buildings of this plant, which was engaged in manufacturing heating units for military property. The fire appeared to have orginated near a chimney in the storage section of the plant. It was well advanced when it was discovered by the watchman, and by the time the fire department reached the scene both buildings were involved. The buildings were ninety feet wide by 450 and 360 feet long respectively. They were without sprinkler protection and each building enclosed very large

Acme.

Great Northern Elevator X at Superior, Wisconsin, was destroyed by fire on January 10, 1942, with a loss of $1,750,000. Violent grain dust explosions following the start of fire, due to mechanical failure in an elevator leg, wrecked the sprinkler system.

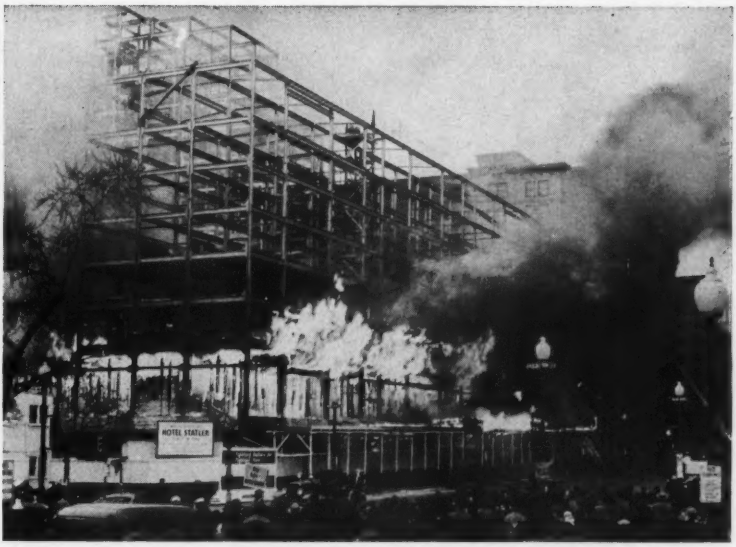
areas without cut-offs. Saved by the fire department was the third principal structure, the foundry building. According to press reports, there was a serious loss of valuable records and blueprints.

January 21, Cincinnati, Ohio. Netherlands Plaza Hotel. Loss: $559,000.

Fire in the air conditioning equipment room of this modern fire-resistive hotel was extinguished with little spread from the immediate area of its origin, but smoke and water caused extensive damage to the building and contents. The fire was caused by sparks from an acetylene cutting torch which ignited the cork insulation on air ducts. There was a delay of several minutes before calling the fire department while employees worked ineffectually with standpipe hose lines, many of which became tangled and burst. Some difficulty was encountered in reaching the seat of the fire because of the arrangement of the numerous air ducts. (April, 1942, QUARTERLY, page 337.)

February 8, Washington, D. C. Statler Hotel. Loss: $330,000.

The combination of wooden construction forms, flammable tarpaulins, open flame salamanders and a high wind resulted in a fire severely damaging this hotel building which was under construction. An exposed office building was also damaged. It is thought that the wind caused a loose tarpaulin to blow against one of the oil-burning salamanders, upsetting it and igniting the wooden construction forms. Though the nearest fire station was less than a block away, the wind-swept flames gained great headway before the fire department got water on the fire, a matter of some twenty minutes. Many of the steel members required replacement, and the use of the building, which is sorely needed



Acme.

This blaze, attributed to ignition of a tarpaulin by an oil-fired heating salamander, delayed construction work on the new Statler Hotel building in Washington, D. C., and caused a loss estimated at $330,000. Although a fire station was less than a block away and a fire alarm box may be seen in the picture close to the building, there was considerable delay in calling the fire department. Apparently everyone on hand assumed someone else had given the alarm.

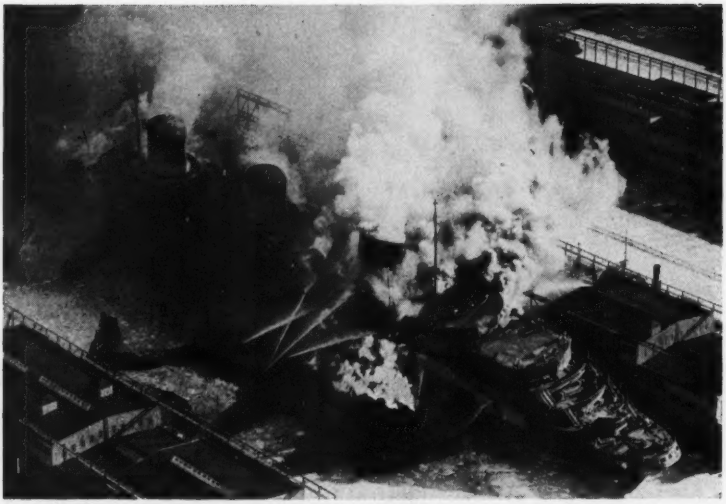
to relieve the critical shortage of office and hotel space, was considerably delayed by the fire. Estimates place the total loss, including exposure damage, at about $330,000.

February 8, Denver, Colo. A. Carbone & Co. Loss: $250,000.

Fire of uncertain origin swept through this three-story brick liquor warehouse, leaving little more than the four walls standing. The fire was well advanced when discovered by a passer-by, and the fire department was obliged to concentrate its efforts on preventing the spread of the flames to near-by structures. Snow and ice hampered the work of firemen. Fire officials reported that the fire apparently started on the first floor directly over the heating unit and spread upward through the elevator shaft. The building had recently been equipped with an automatic sprinkler system, but this had not yet been connected to the water main, because of priority difficulties in obtaining certain necessary valves.

February 9, New York, N. Y. S.S. *Normandie*. Loss: $53,000,000.

Sparks from an acetylene cutting torch ignited a quantity of kapok life preservers stored in the main salon of this former French liner, and this touched off the largest and most talked of fire loss of the year. The ship was being converted for use as a troop transport when the tragedy occurred. The fire spread through a considerable portion of the vessel, but the greatest loss was incurred



International.

View of the blazing "Normandie" during the fire of February 9. As a result of this blaze the former French luxury liner, said to have cost $53,000,000, capsized at her pier in New York harbor. This vessel was being converted to a naval transport when sparks from an acetylene torch ignited kapok life preservers, starting the fire on its course through the combustible interior.

when the ship capsized due to the weight of water used in combating the blaze. The extent of the fire may be attributed to the highly combustible contents of the main salon where the fire started, the lack of proper cut-offs between areas, lack of coördinated responsibility, poor fire fighting by the ship's fire brigade, and delay in calling the fire department. A workman lost his life when he fell from a ladder to the deck. It is not possible to determine yet what the monetary loss will be, as work is still going on in an attempt to right the vessel. The original cost of the ship approximated $53,000,000. More serious than the financial loss, however, is the needless loss of an important naval auxiliary vessel in time of war. (July, 1942, QUARTERLY, page 52.)

February 10, Dallas, Texas. Exposition Building. Loss: $303,000.

An exposition building at the fair grounds was completely destroyed by a fire which is believed to have been caused by careless smoking. The building was a single story brick and timber structure which, except during the annual State Fair, was operated as a roller skating rink and basketball stadium. Shortly after midnight fire was discovered coming through the roof, and although the alarm was sounded promptly, the flames had made such headway that the efforts of the firemen were futile.

February 19, Brooklyn, N. Y. Multiple Occupancy. Loss: $250,000.

This was a large three-story and basement brick-joist building in the downtown district. The basement and third floor were used as a warehouse,

the first floor as a 5 and 10 cent store and the second floor as a dance hall. About five o'clock on the morning of the fire the dance hall watchman was making himself a cup of coffee on a gas or gasoline stove when the stove "exploded." He was unable to extinguish the resulting flames and ran to a window to call for help. When he opened the window, the draft pulled the flames from the kitchen section into the open area of the dance hall and in an instant the combustible decorations were all ablaze. Four alarms were sounded, but eventually the two upper floors and their contents were a total loss. Estimates place the damage at $250,000.

February 24, Seattle, Wash. Salmon Bay Terminal. Loss: $250,000.

Fire which started in a fish net shop destroyed two unsprinklered pier warehouse structures and damaged a third. The fire was caused by the ignition of vapors of a petroleum distillate, which was being used to thin a net preservative compound. The greater part of the loss was due to the destruction of a large number of nets, and while the value of the nets destroyed had not been established at the time of our reports, it is apparent that including indirect values due to the difficulty of replacement, the loss to buildings and contents will run to at least $250,000. Early estimates of the loss were as high as $500,000.

March 6, near Las Vegas, Nev. Basic Magnesium Corp. Loss: $750,000.

Fire, believed to have originated from a defective furnace installation, swept through the administration building of this vitally important war plant, reducing the frame structure to a mass of embers. The building was of very light construction, one story in height, and measuring about 300 feet by 400 feet. There were no cut-offs or fire walls in the building and private fire protection consisted of a two-inch water line and a private fire brigade. On the day of the fire the wind was so strong that most outside work on the construction of the plant had been suspended. The fire started on the windward side of the building and spread so rapidly that office employees had to jump out of the windows to escape. The Las Vegas fire department attempted to respond, but the road between Las Vegas and the plant, thirteen miles outside the town, was so congested with sightseers that the firemen were considerably delayed. Several other fires have occurred subsequently at this plant.

March 11, San Diego, Calif. Bekins Van & Storage Warehouse. Loss: $257,500.

Fire of unknown origin occurred on the sixth floor of a fire-resistive concrete furniture warehouse. The entire top floor was involved when the fire was discovered by a passer-by. Firemen experienced difficulty in reaching the flames and were obliged to break holes through the reinforced concrete roof. The lack of automatic sprinklers, large undivided areas and the delayed discovery of the fire contributed to the large loss. While the fire damage to the building was only about $7,500 on a $150,000 valuation, the fire and water damage to the contents had been estimated at $250,000. A large part of the loss consisted of government-owned parachute silk and airplane parts which were stored in the basement and on the fifth and sixth floors among household goods. The practice of piling stock directly on undrained floors materially increased the water damage.

THE CAUSE

THE RESULT

A man was fatally burned and $461,000 damage resulted from a fire occurring at Portland, Oregon, on March 27, as the result of a collision between a gasoline tank truck and a locomotive. Flames spread to the Fred Meyer grocery warehouse shown above, the contents of which suffered the greater part of the loss.

March 20, Fredericton, N. B., Can. Group Fire. Loss: $250,000.

Fire of undetermined origin destroyed three buildings in the mercantile district of this city. The buildings involved were three-story brick-joist structures occupied by numerous retail stores and offices. Unprotected roof skylights are said to have been a factor in the spread of the fire. The wind was strong and a number of roof fires were started by flying brands, but these were brought under control with small damage. Property loss has been estimated at $213,791, but indirect losses are expected to bring the total up to $250,000.

March 22, Danville, Ky. Danville Leaf & Tobacco Company. Loss: $250,000.

Fire of unknown origin destroyed the redryer warehouse and power plant of this tobacco processing establishment. The building involved was a two-story metal clad frame structure with oil-soaked wooden floors. The fire was discovered by a taxi driver who was attracted to the scene by the sky glow. He notified the fire department, but by the time the apparatus arrived, the fire was beyond control. A high wind forced the fire fighters to concentrate their efforts on preventing the spread of the fire to other structures. A barn a half mile distant was ignited by flying brands, but the flames were extinguished with but small damage.

March 27, Portland, Ore. Fred Meyer Warehouse. Loss: $461,000.

Collision between a gasoline tank truck and a switching locomotive caused a fire which spread to a grocery warehouse and resulted in fire damage estimated at $461,000. The property involved was a two-story concrete warehouse with wooden joisted interior. The 10,000 square foot interior area was not subdivided by fire walls, vertical openings were unprotected, and automatic sprinklers were lacking. Burning gasoline from the overturned tank truck flowed into the basement of the building and the fire spread rapidly through the closely packed stock. The engineer of the locomotive was fatally burned. The total loss resulting from this fire has been estimated at $461,000, of which about $400,000 represents damage to the contents of the warehouse.

April 2, Akron, Ohio. 20th Century Heating & Ventilating Co. Loss: $332,000.

This was a large furnace factory of 1 and 3-story, old brick construction. The south end of the plant was cut off by a standard fire wall and doors and was occupied by the Gorman Foundry Co. The property was protected by an automatic fire alarm system under central station supervision, and the system operated to call the fire department, which responded promptly. The plant was without watchman service and had been locked up for the night. This hampered somewhat the immediate efforts of the firemen. The cause of the fire has not been established, but it has been suggested that sparks from a cupola may have been responsible. Driven before a strong wind, the fire spread rapidly throughout the furnace factory section of the plant, which was one large fire area. Within less than half an hour practically the entire furnace factory was afire and it was apparent that little could be done except prevent the spread of the flames to the foundry section and other buildings near by. The direct loss from this fire has been estimated at about $332,000. Indirect losses were large, although for the most part uninsured.

The 20th Century Heating and Ventilating Co. plant at Akron, Ohio, was destroyed with a loss of $332,000 on April 2. The property was provided with an automatic fire alarm but was without sprinkler protection. The plant was without watchman service and was locked for the night when firemen arrived. Driven by a strong wind the fire spread rapidly through the large structure. A fire wall with openings protected with fire doors enabled firemen to save an adjoining section of the property housing a foundry concern.

April 5, Abilene, Texas. Western Compress & Storage Co. Loss: $375,000.

This was a large unsprinklered cotton compress and storage shed of light frame, open joisted construction. Fire was observed by the watchman during the evening, and investigating, he found fire in about five bales. He made no attempt to use inside standpipe hose lines which were available, but immediately pulled an auxiliary fire alarm box which was supposed to operate a master box located on the street near by. The auxiliary box failed to operate, however, and the fire department responded several minutes later in answer to a telephone message. The fire spread rapidly over the baled cotton and very quickly the entire 90,000 sq. ft. area was involved. The compress shed and 3370 bales were completely destroyed.

April 12, Richmond, Ind. Group Fire. Loss: $292,000.

Fire, originating in the basement of a four-story brick-joist store and office building, spread rapidly through unprotected vertical openings, causing the collapse of floors and subsequent extension of the fire into two adjacent buildings. The fire completely destroyed the Nusbaum Building in which it originated and severely damaged the two buildings on either side. When the floors and roof of the Nusbaum Building collapsed, huge holes were opened in a party fire wall, allowing the fire to spread to the adjacent building on that side. Collapsing walls of the Nusbaum Building severely damaged the building on the opposite side and allowed the fire to gain a foothold there. While the cause of the fire could not be determined, spontaneous ignition of coal is suspected as the origin. Some twenty-five tons had been placed in the Nusbaum Building about two weeks previously. The large loss is attributed to the late discovery of the fire, the quick-burning interior construction and unprotected vertical openings through all floors.

April 12, Portland, Ore. West Oregon Lumber Co. Loss: $500,000.

Fire of uncertain origin, but which started in an area where welding operations had been carried on earlier, destroyed a large portion of the sawmill building together with the woodworking machinery it contained. The large loss can be attributed to the fact that the sprinkler system in the portion of the plant which was destroyed was shut off at the time of the fire. The plant as a whole is of heavy wood construction with light wood walls and composition covered wooden roof. The plant had been shut down two days previously while millwrights were making various necessary repairs to certain equipment. One of the head millwrights shut off the dry pipe sprinkler system and disconnected some piping which interfered with their work. He did not plug the piping and then turn the system on again or even notify anyone in authority that the system had been shut off. The fire started at 2:55 A.M., about an hour after the millwright crew had quit work and left the plant. The fire was held in check almost on a straight line across the end of the mill by other sprinklers which were still in service. Three fireboats and fourteen pieces of land fire apparatus responded to this fire. The property loss has been estimated at about $250,000, plus approximately an equal amount in use and occupancy loss.

The 20th Century Heating and Ventilating Co. plant at Akron, Ohio, was destroyed with a loss of $332,000 on April 2. The property was provided with an automatic fire alarm but was without sprinkler protection. The plant was without watchman service and was locked for the night when firemen arrived. Driven by a strong wind the fire spread rapidly through the large structure. A fire wall with openings protected with fire doors enabled firemen to save an adjoining section of the property housing a foundry concern.

Wide World.

Shown above is the result of a $1,650,000 conflagration which, starting in a large-area unsprinklered dry goods store, swept through a portion of the business district of Kewanee, Illinois, on April 13. The blaze, quickly beyond control of the undermanned local fire department, was checked through the aid of outside departments after 17 buildings had been destroyed and 10 others damaged.

A small boy who had concealed himself in a department store for the purpose of theft, was responsible for a fire which caused $303,000 loss in Janesville, Wisconsin, on April 13. During his prowl in the store the boy dropped a match in a box of waste paper. The building, constructed on piling over a river, collapsed into the water shortly after firemen arrived. The fire spread to an adjoining building through unprotected wall openings.

April 13, Kewanee, Ill. Conflagration. Loss: $1,650,000.

This conflagration swept through portions of two blocks, consisting mainly of two- and three-story brick-joist business buildings. The fire started during the night in the large unsprinklered three-story building of the Kewanee Dry Goods Co. The fire spread quickly up the open elevator and stair shafts from the basement to the top floor. A high wind was blowing and in about twenty minutes the windows of the building across the street were breaking from the heat. Before the fire was brought under control, a total of seventeen business buildings had been destroyed and ten others damaged. The insurance loss exceeded $1,650,000 on property valued at $2,568,750. No information is available as to the amount of the uninsured loss. (July, 1942, QUARTERLY, page 69.)

April 13, Janesville, Wis. Group Fire. Loss: $303,000.

Fire started by a small boy in a department store destroyed or damaged several unsprinklered brick-fronted frame buildings in the business section of

local fire department, was checked through the aid of outside departments after 17 buildings had been destroyed and 10 others damaged.

Press Association.

This railroad supply warehouse and office building in Chicago was destroyed by fire with a loss of $250,000 on May 25. The fire occurred two hours after employees quit work but before the night watchman was scheduled to go on duty. Limited water supplies from private hydrants confined fire fighting operations to the protection of exposures.

the city. The child responsible for the fire had secreted himself in a washroom, where he remained until after the store closed for the day. In searching about later for something to steal he accidentally threw a lighted match into a box of waste paper. Unable to extinguish the flames he escaped from the building and the growing fire was not discovered until nearly an hour later. The building was constructed on wood and cement piling over a river and collapsed into the water a short time after the arrival of the fire department. The fire had already entered the adjoining building through unprotected openings in the party wall. Fire traveled seventy-five feet under the bridge structure and ignited the wood flooring and exposed timbers of another building, but the flames were quickly checked. The fire was finally extinguished by the Janesville Fire Department, assisted by firemen and equipment from four near-by towns. Local auxiliary firemen rendered valuable aid.

April 25, Taneytown, Md. Blue Ridge Rubber Co. Loss: $438,000.

This was a large unsprinklered two-story brick-joist factory engaged in the manufacture of rubber and canvas footwear. The fire started from an undisclosed cause in the center of main section of the plant. Due to the use of volatile solvents and the large open area of the main section, the fire was beyond control within a few minutes after it was discovered by the watchman. The local volunteer fire department responded to a telephone call relayed by a passer-by, but was unable to check the fire. The building and contents were completely destroyed.

May 1, Rhode Island Forest and Brush Fire. Loss: $3,000,000.

A forest fire of incendiary origin swept over about fifty square miles of brush and woodland in the southwestern part of the state. In the fire area were many farms and some 1,500,000 board feet of lumber. The area was placed under martial law by the Governor while nearly 3000 men fought the fire, which burned for four days. The town of Greene was practically wiped out and scores of buildings were destroyed in other sections. Estimates of the damage run as high as $3,000,000.

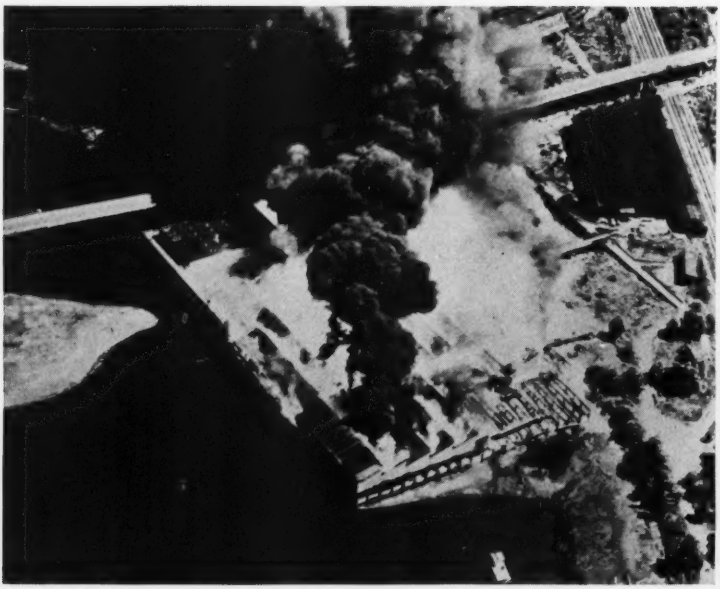
May 24, South Walpole, Mass. Diamond Match Co. Loss: $250,000.

Fire which started during the night near the center of the lumber storage yard spread to the buildings of this woodworking plant and destroyed all but two small structures. The plant was engaged in the manufacture of fabricated houses and other products for the government. The fire had gained great headway before it was discovered, and the severe exposure, congestion of stock, and lack of private fire protection facilities contributed to the large loss. The loss has been estimated at not less than $250,000.

May 25, Chicago, Ill. Railroad Property. Loss: $250,000.

This was an unsprinklered two-story brick-joisted building owned by the Illinois Central Railroad and occupied by them as an office building and storage warehouse for railway supplies, including paint, oil, rubber, and upholstery materials. The building was regularly without any supervision from 4:30 P.M. when the employees quit work until 8:00 P.M. when the night watchman came on duty. When the fire was discovered about 6:30 P.M. it was in full possession of the building, having spread through open elevator and stair shafts. Firemen, hampered by limited water supply from private yard hy-

This railroad supply warehouse and office building in Chicago was destroyed by fire with a loss of $250,000 on May 25. The fire occurred two hours after employees quit work but before the night watchman was scheduled to go on duty. Limited water supplies from private hydrants confined fire fighting operations to the protection of exposures.



Press Association.

The Clear Fir Lumber Co. on Day Island near Tacoma, Washington, was making doors and millwork prior to the $264,000 fire of May 26. The fire followed welding operations on a planer. A blower system carried the fire through the highly combustible unsprinklered plant.

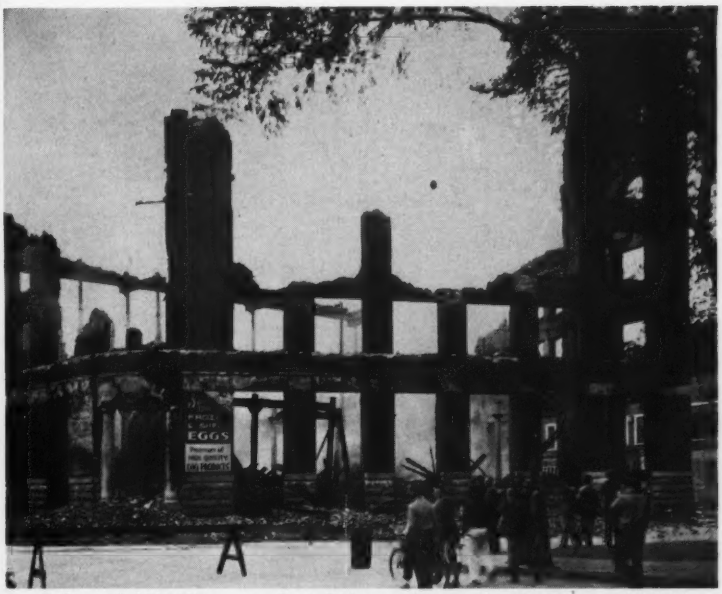
drants, were obliged to largely confine their efforts to preventing spread of the fire to near-by buildings. The loss to building and contents has been estimated at $242,000, with additional losses to exposed property.

May 26, near Tacoma, Wash. Clear Fir Lumber Co. Loss: $264,000.

This was a large frame woodworker engaged in the manufacture of doors and millwork. At the time of the fire, a workman was making some repairs which involved welding on a planer. The planer became heated, so the welder suspended operations for a few minutes to allow the metal to cool. Soon after he resumed work, another worker saw smoke in the blower pipe, and believing the blower to be operating, he attempted to shut it off. The blower was already off, however, and when he operated the switch the blower began to force fire through the entire building. The building was equipped with a private alarm system under central station supervision, but was lacking in private fire protection facilities. The frame construction, highly combustible contents, and the remote location of the plant outside the city limits all contributed to the large loss. The Tacoma fire department responded and succeeded in saving near-by property.

June 5, Indianapolis, Ind. National Starch Products, Inc. Loss: $605,000.

Fire following a series of dust explosions destroyed or damaged several units of this medium-sized starch plant. The plant did not meet modern require-

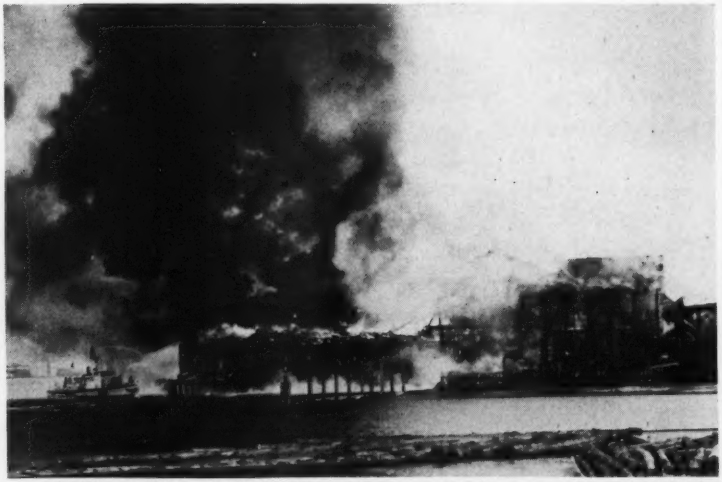


A loss of $448,000 occurred at Dubuque, Iowa, shortly before midnight on June 12, when the Iowa Egg Products Co. plant and an adjoining poultry produce plant were destroyed by a fire starting in an egg dryer. An alarm was delayed some twenty minutes while employees fought the blaze with first aid appliances. When firemen arrived the entire building was involved. A falling wall carried the fire into the adjoining plant.

ments in construction, equipment, dust control, or segregation of processes. Three explosions occurred which caused so many sprinkler heads to open that the sprinklers were ineffective and were shut off to conserve water for the fire department pumpers. The fire spread very rapidly and the fire department is credited with excellent work in bringing the fire under control. The loss from the fire has been estimated at about $455,000, plus use and occupancy loss of about $150,000. (July, 1942, QUARTERLY, page 75.)

June 9, Dallas, Texas. Southwest Tablet Mfg. Co. Loss: $500,000.

Fire which is believed to have originated from careless smoking destroyed this stationery manufacturing plant. The plant was a single story unsprinklered brick building with a concrete floor and open-finish wood joist, composition roof. There were large quantities of paper stock in the building at the time of the fire. First aid fire appliances were provided and the building was equipped with an automatic fire alarm system under central station supervision. The fire occurred at about 2:45 A.M., nearly four hours after the night shift quit work. The night watchman on duty was required to operate a cutting machine when not actually making his rounds and he was thus engaged when the automatic alarm system operated. He discovered a small fire burning over the top of four or five bales of waste paper and attempted unsuccessfully to extinguish the fire with two 1-quart vaporizing liquid extinguishers. Mean-



The Henry Mill and Timber Co. at Tacoma, Washington, suffered a $361,000 fire loss on June 15. Embers from a refuse burner driven by a high wind presumably ignited the frame unsprinklered sawmill. The fire had gained great headway prior to discovery.

while the fire department was called by the central station. There was some delay in gaining admittance to the rear of the building, where the fire was located, because of a locked steel door. By the time the fire department finally did gain access the fire was burning furiously. One of the first two pumpers to arrive soon broke down, and further delay was experienced when firemen laid too short a line of hose and were obliged to shut down long enough to add a length. Three alarms were finally sounded, but despite the heavy response of firemen and equipment, the interior of the plant was practically gutted. Except for some limited salvage, the loss was total. The use and occupancy loss alone has been estimated at $129,000.

June 12, Dubuque, Iowa. Iowa Egg Products Co. Loss: $448,000.

Fire originating in an egg drier resulted in the destruction of this large egg drying plant. An adjoining two- and four-story poultry produce plant was also consumed and there was moderate damage to other near-by structures. The building where the fire started was a five-story brick-joisted structure with unprotected floor openings at stairways and elevator and lacking automatic sprinkler protection. The plant was operating on a 24-hour day, endeavoring to fill large government orders for powdered eggs. Shortly before midnight, fire was discovered in one of the driers. This was not unusual as there had been several previous fires in the driers due to overheated conditions, which had been readily extinguished with first aid fire appliances. There were five or six employees on hand when this fire occurred and they attempted unsuccessfully to extinguish the flames. The fire was soon beyond control and the foreman then telephoned the fire department. By this time there had been a delay of nearly twenty minutes from the discovery of the fire to the summoning of the

International.

The futility of relying upon even the strongest public fire protection as a substitute for automatic sprinklers is well illustrated by this picture of a fire which destroyed the Great Atlantic Paper Co. warehouse in New York City on June 20th with a loss of $750,000. The seven-story building was without any private protection other than iron shutters. Firemen responding to five alarms poured thousands of gallons of water a minute into the building from the outside, but the flames bursting from the center of the roof show that these streams could not penetrate to the heart of the fire.

fire department. When the firemen arrived the entire building was involved. The adjoining poultry produce plant was destroyed after the fire wall between the two properties collapsed, but the fire department saved other exposed property.

June 15, Tacoma, Wash. Henry Mill & Timber Co. Loss: $361,000.

Embers from a refuse burner were driven by a high wind into the second floor of a sawmill, setting fire to the unsprinklered frame structure at that point. The fire was not discovered for as much as 20 to 30 minutes, by which time it had gained tremendous headway. Employees and firemen succeeded only in preventing the spread of the flames to other buildings.

June 20, New York, N. Y. Great Atlantic Paper Co. Loss: $750,000.

Fire, believed to be of electrical origin, destroyed this heavily constructed, seven-story brick and timber paper warehouse. The property was completely lacking in fire protection equipment except iron shutters. The fire in the building was discovered within a few minutes after the fire department and utility employees were called to extinguish a fire in a near-by underground electric cable connection box. Firemen were hampered by severe smoke conditions. The building was stocked to capacity with heavy rolls of wall paper and miscel-

The J. C. Sanders Cotton Mill at Pritchard, Alabama, was destroyed on August 8, with a loss estimated at $500,000. Automatic sprinklers and private hydrants were found to be without water by the first firemen to arrive. One-half an hour later this was found to be due to a closed valve at the 50,000-gallon gravity tank. There is said to have been considerable delay in starting the steam fire pump at the mill.

laneous commercial paper stock, which swelled with the application of water, causing the walls of the building to collapse. The collapsing walls reduced to shambles an adjacent single story brick building and this in turn buried a fire department ladder truck. Loss may exceed $750,000.

July 19, Baltimore, Md. Western Automobile Supply Co. Loss: $900,000.

This was a large unsprinklered single-story brick building occupied as a storage warehouse for automobile accessories, sporting goods, lubricating oils, etc. The building had an area of nearly 59,000 square feet and was undivided except for a fire wall which cut off the office area. It was equipped with an automatic fire alarm system which sent in an alarm to the central station a few minutes after midnight. There was no outside evidence of fire when the firemen arrived, but upon opening the doors the flames gained great headway due to the admission of fresh air. The entire area became so quickly involved that the fire department was unable to control the blaze. The loss to building and contents was practically total. Cause of the fire was not determined.

July 21, Cleveland, Ohio. Petroleum Iron Works of Ohio. Loss: $321,000.

Fire, originating in two substandard paint spray booths, caused serious damage to this large unsprinklered single-story brick building which was occupied principally by three metal-working concerns. The building was originally constructed as one area of some 76,000 square feet, but had been subdivided by poorly constructed 4-inch tile panel partitions for occupancy by tenant manufacturers. Private fire protection facilities were poor and there was no watchman employed, but certain areas of the building, including that where the fire started, were under central station automatic fire alarm protection. The fire was discovered in the section occupied by the Petroleum Iron Works Co. of Ohio some time after the plant had closed down for the night, when the ringing of the automatic fire alarm attracted the attention of a foreman working in another section of the plant. At that moment the spray booths were burning furiously, with flames mushrooming out on the underside of the plank roof. The fire department responded promptly, but already the fire was of such intensity that it was impossible to gain access to the burning sections. The fire was fought with outside hose streams, but these had a very limited effect. It is reported that about 80 per cent of the building was a total loss, with small sections at opposite ends only slightly damaged.

August 5, Mellen, Wis. Penokee Veneer Co. Loss: $500,000.

Fire of uncertain origin destroyed this veneer manufacturing plant said to have been the largest factory in the world engaged in making veneer for airplane construction. The fire started in the drying room on the top floor of the unsprinklered two-story brick-joist building and spread throughout the structure. The fire was discovered by the watchman during the early morning. By the time the volunteer fire department arrived the flames had gained great headway and the entire second floor was soon involved. Efforts of the firemen to save the lower floor were unsuccessful. The loss has been estimated at from $450,000 to $500,000.

August 8, Pritchard, Ala. J. C. Sanders Cotton Mill Co., Inc. Loss: $500,000.

Fire of undetermined origin occurred in the main mill building during the early morning and completely destroyed the building. As the loss is in litiga-

sprinklers and private hydrants were found to be without water by the first firemen to arrive. One-half an hour later this was found to be due to a closed valve at the 50,000-gallon gravity tank. There is said to have been considerable delay in starting the steam fire pump at the mill.

tion many important details are lacking. It is understood, however, that the automatic sprinklers and private hydrants were useless because the valve controlling the water supply from the 50,000 gallon tank was closed. The local fire department was unable to get water from the private yard hydrants and called for aid from Mobile. Upon arrival, the Mobile Fire Department promptly opened the main tank valve, but this was about thirty minutes after the discovery of the fire. It is also reported that there was considerable delay in placing the steam fire pump in operation because steam pressure had not been maintained in the boilers. The owners of the mill have estimated their loss at $500,000.

August 13, Wolfe City, Texas, Kimbell Milling Co. Loss: $258,000.

Fire of unknown origin destroyed this ironclad frame flour and feed mill. Our information on this fire is scanty, but it is known that the delayed discovery of the fire, combustible nature of the building and contents, and lack of adequate fire protection were responsible for the large loss.

August 24, Norwood, Mass. Winslow Bros. & Smith Co. Loss: $325,000.

Except for fine work by the fire department a much larger loss would have resulted from this fire, which destroyed a large unit of the Winslow Brothers and Smith tannery. The fire, accompanied by several severe explosions, originated during the night of August 24 on the top floor of a large four-story frame factory said to be engaged in filling war contracts. Considerable delay in sending in the alarm was occasioned when employees who discovered the fire fought the blaze with chemical extinguishers. One workman lost his life on the upper floor of the building when he was trapped by the rapid spread of the flames, which had completely involved the three top floors by the time the fire department arrived. There was some delay in getting hose streams into operation until call firemen arrived, the paid fire department force consisting of but six men. It was discovered that the sprinkler valve in the burning building had been closed by the watchman the previous night due to low air pressure on the dry pipe system. There was no necessity for closing the valve, as the system could have been left wet until the dry pipe valve could have been reset. The loss was estimated at $325,000, but it is reported that except for effective fire fighting a loss of two or three million dollars might easily have resulted.

August 31, Lead, S. D. Multiple Occupancy. Loss: $278,000-$433,364.

Fire originating in the basement of a drug store as the result of a defective compressor motor spread through unprotected vertical and horizontal openings to destroy not only the annex housing the drug store, but also the main brick-joisted Hearst Building. Neither the annex nor the main building had automatic sprinkler protection. The main building, two to four stories in height, was occupied by a department store and numerous offices. The fire was discovered by workmen in the building and they exhausted about thirty 2½-gallon soda and acid extinguishers in their efforts to check the fire before calling the fire department by telephone. Inadequate water supplies hampered the fire department, which was inadequately equipped to handle a fire of such magnitude. The loss estimate of $278,000 is reported through insurance channels; the estimate of $433,364 by the fire department.

September 2, near Mt. Pleasant, S. C. Dwelling. Loss: $300,000.

The spacious and elaborate winter home of Prince Guido Pignatelli on the Wando River, about ten miles from Mt. Pleasant, was totally destroyed by a fire of unknown origin. The thirty-two room mansion was unoccupied at the time of the fire, which was first observed by watchers in an observatory at Fort Moultrie, eight miles distant. The caretaker of the estate had earlier heard a muffled explosion, but on looking out from his quarters had observed nothing unusual and did not investigate further. By the time the fire was first observed the property was beyond saving. There was no public fire protection.

September 7, Texas City, Texas. Pan-American Refining Corp. Loss: $750,000.

Two men were killed and severe property damage was suffered in an explosion and fire which occurred when vapors escaping from a naphtha tank were ignited by a furnace. The detonation is said to have shaken the city. The escaping naphtha fumes were carried by the wind to the plant power house, where ignition took place. A flash-back followed and then an explosion which not only demolished the tank, but also wrecked a near-by pump building and damaged the power house. Other smaller explosions occurred when the fire reached a number of partially filled fuel oil tanks. Volunteer firemen and employees fought the blaze, which burned for nearly four days.

September 8, Rockport, Calif. Rockport Redwood Co. Loss: $300,000.

This property, also known as the Cottoneva Redwood Co., was a large lumber mill, located in an isolated coastal community. All buildings were of wood construction, and are believed to have been unsprinklered. Little is known of the details of the fire except that the sawmill, planing mill, and power house were destroyed in about an hour and a half. Employees fought the fire with hose streams from private yard hydrants. Pressure was supplied by two steam fire pumps.

September 9, Toronto, Ont., Can. White's Hardware Co. Loss: $368,000.

Fire of undetermined origin destroyed this three-story unsprinklered brick-joisted building together with its contents. The building was occupied by two hardware merchants as retail stores and stock warehouses. Smoke was observed issuing from the second story by the watchman. The alarm was sounded promptly, but the flames spread rapidly, feeding on paint, turpentine and other flammable liquids, and the fire was soon beyond control. It is believed that the fire started in the basement and spread upward through the unprotected elevator shaft. It had apparently been burning for a considerable time before it was discovered.

September 10, near Enid, Okla. Champlin Refining Co. Loss: $750,000.

Fire originating in the main rerun distillation area, and involving stills, tanks and considerable other refinery equipment, occurred shortly before midnight. It was caused by a boil-over and flash of reduced crude oil which spilled from a large charging tank. The intensity of the fire, which burned for about fifteen hours, prevented close combat, but the private fire brigade apparently did a good job in confining the fire by the use of foam. The plant was located beyond the city limits and the Enid Fire Department was not called.

September 11, Taunton, Mass. Silver Manufacturers. Loss: $375,000.

This was a moderate sized brick mill property occupied by two allied silver concerns, the National Silver Co. and the F. B. Rogers Silver Co. The plant was protected by an overloaded dry pipe sprinkler system. On the night of the fire a few men were doing spot welding in the basement of the single-story section of the plant near the lacquer dipping department. A spark from the welding machine apparently dropped into pyroxylin scrap on the floor. Workmen attempted to extinguish the resulting flash fire without calling the fire department, but the flames soon ignited lacquer in open tanks near by. There was further delay in calling the fire department because a private fire alarm box was locked, the key missing, and the office where the telephone was located was also locked. The chief of the local fire department happened to be near the plant when the fire broke out. He found the outside post indicator valves shut when he arrived. At that time the entire single-story section was a mass of flames and the fire was spreading to the main four-story building through unprotected window openings. He then had the sprinkler valves opened, but was obliged to reclose them to obtain water for hose streams because of loss of water through the many sprinklers which had opened. Public facilities were inadequate to control a fire of such proportions and the loss was total. Who shut the sprinkler valves, which are known to have been open two days before the fire, and why they were shut has not been established.

September 18, Carteret, N. J. Chemicals Manufacturer. Loss: $400,000.

The plant of the Westvaco Chlorine Products Co. covers a large area and consists of a group of buildings of mixed construction. The concern is engaged in the manufacture of chemicals for munitions. The fire originated in the basement of a three-story brick building and is believed due to an overheated oil-burning dryer which apparently ignited the floor joists above it. The building was unsprinklered and this, coupled with an inadequate water supply for hose streams, contributed to the large loss. The building where the fire started was destroyed and other structures were damaged. The loss has been estimated roughly at $400,000.

September 24, Honey Grove, Texas. Cotton Warehouse. Loss: $260,000.

Fire of uncertain origin destroyed one compartment of a two-compartment cotton compress and warehouse, together with a large quantity of cotton. This property, known as the Farmers & Merchants Compress & Warehouse Co., was a large unsprinklered brick structure partially open on one side. On discovery, the fire was beyond control of the watchman, who promptly notified the fire department by telephone. The compartment involved had an area of 83,000 square feet and once the fire was well started the part paid fire department was entirely inadequate to prevent its involving the whole compartment. A sixteen-inch fire wall saved the remaining compartment.

September 29, Key West, Fla. Dredge *Norman H. Davis*. Loss: $500,000.

This Diesel dredge, valued at $500,000, was destroyed by fire which followed a flare-back of the fires under the boilers. The vessel was anchored in the harbor a considerable distance from shore, and no fire fighting assistance from the land could be rendered. Further details are lacking.

Tenant manufacturing buildings in Pawtucket, Rhode Island, housing the North Easton Plastics Corp. and the Royal Yarn Co., were discovered to be on fire by a passer-by late on Sunday afternoon, October 11. The buildings, without watchman or fire alarm service, had at one time been equipped with automatic sprinklers, but these had been out of service for many years. Loss: $250,000.

October 2, Tiffin, Ohio. Tiffin Art Metal Co. Loss: $300,000.

This was a small sheet-metal worker which had recently converted 100% to the production of war materials. The fire occurred when a tank of paint under pressure ruptured, spreading the flames with almost explosive rapidity through the room where about fifteen persons were employed. Although numerous exits were available, one woman was trapped and burned to death. The plant was not equipped with automatic sprinklers and the fire was beyond control when the fire department arrived. The flames spread through unprotected openings and destroyed the plant, with a loss estimated at from $250,000 to $300,000.

October 11, Pawtucket, R. I. Tenant Manufacturers. Loss: $250,000.

Involved in this fire were two brick and plank on timber buildings, two and three stories in height, which had formerly been units of a textile finishing concern. The buildings were principally occupied at the time of the fire by the North Eastern Plastics Corp. and Royal Yarn Co. The automatic sprinkler systems with which both structures were equipped had been out of service for many years. No watchman was employed nor was there any private fire alarm system. The fire was discovered late on Sunday afternoon by an outsider. When the fire department arrived it was impossible to tell in which of the two buildings the fire originated, as both were completely involved. Both buildings were destroyed. The fire spread by means of a frame bridge to another building, which was considerably damaged.

October 16, Hickman, Ky. The Mengel Co. Loss: $350,000.

Fire from an unknown cause started in an unsprinklered vacant space under the sprinklered veneer mill at this plant, resulting in its complete de-

struction. The mill was a frame ironclad structure with a joisted floor. A vacant unsprinklered space about three feet high extended under the entire area, which was enclosed with chicken wire and kept clear of all débris and other combustibles. The fire was discovered when employees noticed smoke and a small flame coming through the floor. The newly organized private fire brigade responded at once and the volunteer public fire department was summoned. It was apparent that the fire had gained considerable headway before discovery and the dense smoke and low space made difficult the use of hose streams. Fire soon broke through the floor in many places and a number of sprinklers opened. At this time the water supply to sprinklers and hoses was adequate, but soon the floor collapsed and the fire was out of control. It is probable that a large number of sprinklers opened following the collapse of the floor and could not be adequately supplied with water. In about an hour the first section of roof fell in and the sprinklers were then shut to conserve water. One system after another was shut off as the destruction of the roof progressed. In another hour the manufacturing building was destroyed and the fire around the engine room and boiler house was under control. Plant officials placed the loss at slightly under $350,000.

October 17, Portland, Ore. Roberts Brothers Warehouse. Loss: $253,000.

Fire originating in the basement of this department store warehouse resulted in the destruction and collapse of this unsprinklered building and serious smoke and water damage to two other unsprinklered buildings. The structure, which was used as a warehouse, an annex to the main Roberts Brothers store, had been designed as an office building. During the course of the fire the water-soaked commodities so overloaded the structure that the floors collapsed, thus increasing the difficulties of fire fighting. The fire was discovered near an elevator shaft by the watchman on the second floor. He sounded the alarm promptly over the central station fire alarm system, but the fire was well advanced by this time and the fire department was hard pressed to confine the fire to the building of origin. The building loss was placed at about $38,000, but the loss to stock approached $200,000. Other losses brought the total to nearly $253,000.

October 20, Cleveland, Ohio. I. J. Fox, Inc. Loss: $450,000-$850,000.

A small fire in the I. J. Fox customers' garment storage room on the second floor of a modern fire-resistive cold storage warehouse caused severe damage to fur, cloth, and fur-trimmed coats in storage. Extreme difficulty of access to the smouldering fire allowed the smoke, combustion gases and water to saturate most of the garments during the ten-hour fire fighting period. Firemen who attempted to approach the fire wearing self-contained oxygen masks were obliged to beat a hasty retreat when the nose clips of the masks were knocked off by the coats, racks and other obstructions in the dark room. The small burning area, not over ten feet maximum dimension at any time, was about thirty feet angularly from the only opening into the room, which was crowded with stock on racks, practically from floor to ceiling. Insufficient oxygen, due to the tightness of the storage room, caused the fire to burn very sluggishly and spread very slowly. The fire was finally ventilated when firemen were able to break holes into the room from an old stair shaft which had been bricked up. Much of the stock was then removed and the fire finally extin-

guished. Although the cause is unknown it is quite possible that careless handling of cigarettes or an unguarded incandescent lamp on the ceiling in direct contact with some coats was the cause of ignition. The loss to the building was about $500, but the damage to the garments has been variously estimated at from $450,000 to $850,000. It is probable that the fire might have been extinguished more rapidly and with less damage if carbon dioxide rather than water had been used.

October 20, near Los Angeles, Calif. Forest and Brush Fire. Loss: $1,627,000.

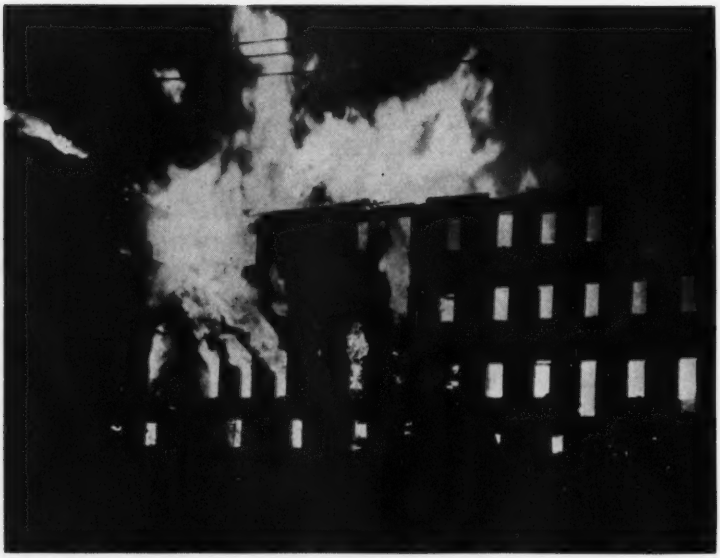
A forest and brush fire, believed to have been of incendiary origin, raged over some 6000 acres of watershed, destroyed sixty-five structures, mostly dwellings, and caused a total loss of $1,626,853, of which $1,481,000 was watershed damage. In computing the watershed damage an arbitrary figure of $250 per acre, as set up for primary watershed by the Southern California Association of Forestry and Fire Wardens, was used. The fire started during the early morning. By the time it was discovered, reported, and reached by fire fighters, an area of twenty acres of heavy brush was involved. Low humidity, shifting winds, and the rugged nature of the terrain were largely responsible for the persistent spread of the fire, which was not entirely extinguished until October 27. In one area some 5000 feet of 1½-inch and 1-inch hose was laid "over country so rough that ropes were used to lower men over cliffs and through cover so heavy that most of the time the men were crawling on their knees or stomachs." The fire was fought by the Los Angeles County Fire Warden Department, the Los Angeles Fire Department, Santa Monica Fire Department, the Army, California State Guard and the Coast Guard.

October 21, Freeport, Ill. Group Fire. Loss: $250,000.

Fire of uncertain origin which started in the plant of the Freeport Silo Co., manufacturer of concrete staves for farm silos, spread to a warehouse occupied by the Kraft Cheese Co. and to other exposed warehouse and coal storage property. The alarm was sounded by police, who noticed smoke coming from the main building of the Freeport Silo Co. When the fire department arrived the entire frame building was in flames. The fire gained entrance to the brick warehouse of the Kraft Cheese Co. through severely exposed unprotected windows. Driven by a strong wind the flames spread across a railroad siding, destroying a steel freight car containing cardboard cartons, and ignited a frame warehouse. Despite the efforts of the fire department the fire continued its course and destroyed a coal shed, small coal office building and another warehouse occupied by a feed company and a waste paper dealer. The total loss has been estimated at $250,000.

October 25, Danville, Ill. H. J. Lauhoff Grain Co. Loss: $400,000.

This former brewery building, ranging in height from one to six stories, was practically destroyed by a fire of uncertain origin which started on the third floor. The plant was engaged in the manufacture of various corn cereal products, including "core binder flour" used in the production of cores for steel castings. The fire occurred about 2:00 A.M. while the plant was in operation. There are several conflicting reports as to the cause, but it is supposed that grain dust may have been ignited by flame from one of the gas-fired purifying machines. There was apparently some delay in calling the fire department while employees fought the flames with first aid appliances, because when



International.

St. Francis College at Loretto, Pennsylvania, occupied a large brick-joisted structure with unprotected vertical openings and was without automatic sprinkler protection. When fire started at 4:30 A.M. on October 30, approximately 100 students and Franciscan brothers were asleep in the building. Fortunately all escaped. The nearest fire company was seven miles distant and only meagre water supplies were available. Loss: $288,000.

the fire department arrived the entire west end of the third floor was involved. The lack of automatic sprinkler protection, highly combustible nature of the contents, wooden interior construction of the building and the numerous unprotected openings made the large loss almost inevitable.

October 30, Loretto, Pa. St. Francis College. Loss: $288,000.

Fire, which started in a storeroom adjoining the kitchen, destroyed a college building, consisting of classrooms, chapel, library, refectory, and sleeping rooms. The cause of the fire was undetermined, but there is some likelihood that spontaneous ignition of cleaning materials may have been responsible. The building was a two- to four-story brick-joist structure, with unprotected vertical openings, no cut-offs, and without automatic sprinkler protection. The fire started about 4:30 A.M. while approximately 100 students and Franciscan brothers were asleep in the building. Fortunately all were able to make their escape. The fire gained great headway before the nearest fire company, seven miles distant, could arrive. Small capacity of the water mains hampered fire fighting.

October 30, East Butler, Pa. Pittsburgh Steel Drum Co. Loss: $511,700.

This metal working plant was destroyed by fire when a workman broke an electric light bulb while he was washing a paint spray gun with toluol. The

This metal working plant at East Butler, Pa., was destroyed by fire on October 30 with a loss of $511,700. Apparently little thought had been given to fire protection beyond the provision of first aid appliances. The building was not subdivided and the paint spraying room where the fire started was loaded with an accumulation of paint drippings. Fire started with the breaking of an electric light bulb while a paint spray gun was being cleaned with a flammable liquid.

highly flammable vapors immediately flashed and the flames spread quickly throughout the plant. Apparently little or no thought had been given to fire protection of this plant beyond first aid appliances. The building was not subdivided. The paint spraying room was of frame construction and was loaded with a great accumulation of paint drippings. Firemen who responded from several surrounding towns succeeded in saving exposed property.

November 4, Edmonton, Alta., Can. Office Building. Loss: $250,000.

Fire of unknown origin, which started on the top floor of this four-story unsprinklered office building, gutted the two upper floors and resulted in severe water damage to the remainder of the building. Thirty-four office tenants suffered total loss and many other places of business sustained damage. Further details are lacking.

November 18, Houston, Tex. Schulte-United, Inc. Loss: $319,500.

Fire, originating on the top floor of this three-story department store, resulted in the destruction of that area and of the roof, which collapsed, and caused severe smoke and water damage to the floors below. The fire was well established when it was discovered about 2:30 A.M. by a street workman. The fire spread rapidly in congested stock and Christmas decorations. Four alarms were sounded. Firemen fought the flames from the outside through windows and through holes cut in the wood roof. This is the usual type of fire loss to be expected in a retail department store of this type without automatic sprinkler protection. The actual fire damage would probably have been much more if it had not been for the enclosed stair and elevator shafts.

November 13, Vancouver, Wash. Shipyard Dormitory. Loss: $340,000.

At least seven persons were dead following a fire which destroyed a two-story frame dormitory at the Henry J. Kaiser shipbuilding plant with a loss estimated at $340,000. The dormitory, known as Hudson House, had an area of some 73,000 square feet, and was one of a number of similar structures which had been erected to house shipyard workers. Hudson House is reported to have had accommodations for 320 persons. The cause of the fire is not known, although it is believed to have started in a linen closet. The fire spread so rapidly through the unsprinklered structure that it was beyond hope of saving when the fire department arrived. Firemen were successful, however, in protecting exposed buildings.

November 16, Pontiac, Mich. Chase Dept. Store. Loss: $390,000.

Fire, cause unknown, originating in a fifth floor storeroom resulted in the destruction of this unsprinklered five-story fire-resistive department store. The building had originally been three stories in height and the two additional stories were supported on steel members, extending up through the building from the basement. Steel work in the roof and fifth floor was unprotected. Lacking adequate ladder facilities, the fire department was unable to ventilate by opening the roof. As a consequence they were not able to check the fire, and the collapse of the roof and fourth and fifth floors spread the fire throughout the building. The loss has been estimated at $185,000 on the building and $350,000 stock damage. (For detailed report see page 208.)

November 16, Geneva, Utah. Columbia Steel Co. Loss: $250,000.

The fallacy of building large, temporary, unprotected, frame buildings with high values for the ostensible purpose of conserving critical materials was illustrated by the fire which destroyed an electrical contractor's supply warehouse at this Defense Plant Corporation construction project. The fire was discovered by a company guard, who called the private fire brigade. They were driven back by the rapid spread of the flames, and realizing that the building was doomed, devoted their efforts to protecting exposed property. Aid was rendered by the fire departments of six surrounding towns. The origin of the fire is believed to have been the careless disposal of smoking materials, although several other causes were possible.

November 17, near Snyder, Tex. Fuller Cotton Oil Co. Loss: $250,000.

Fire, believed due to a machinery spark igniting accumulations of lint in a storage house, destroyed this cotton seed mill with a loss estimated at $250,000. The plant was of metal-clad frame construction, with plank on timber floors. Driven by the wind, the fire spread rapidly over most of the plant. Only the lint and hull house in one corner of the property was saved. The plant was located beyond the city limits and was 1700 feet from the nearest hydrant, which was on a 6-inch water main. The next nearest hydrant was 2300 feet from the plant. The volunteer fire department had hose enough for only one 2½-inch hose line, which was entirely inadequate.

November 19, Fort Richardson, Alaska. Warehouse. Loss: $250,000.

A warehouse, understood to have been federal property, was reported destroyed by fire with a loss estimated at $250,000. Further information is lacking.

This is indicative of what remained of $250,000 worth of critical electrical supplies housed in a temporary unprotected frame warehouse at the plant of the Columbia Steel Co. at Geneva, Utah, on November 16. The plant fire brigade, summoned by a company guard, devoted their efforts to the protection of exposed property.

November 28, Boston, Mass. Cocoanut Grove Night Club.

Four hundred and eighty-nine persons lost their lives in this fire and many others were injured. A report giving the details has been sent to all N.F.P.A. members. Copies are available from the N.F.P.A. Executive Office. It is not possible to evaluate the costs of this fire in specific figures of monetary loss, but it seems clear that the loss of this number of lives and the many injuries represent an economic loss running well into the millions of dollars.

December 1, Heeney, Colo. Warner Construction Co. Loss: $500,000.

Fire leveled the main machine shop of the Warner Construction Co. at the Green Mountain Dam site, thus delaying construction of this huge earth-and-rock-fill dam, believed to be the second largest of its type in the world. The shop building is understood to have been of wood construction on steel framework with an area of 30,000 square feet. The fire started at one end of the structure, which was used as a repair shop and storage place for trucks, tractors and other equipment. A windstorm and blizzard, described as "the worst ever experienced in the community," was in progress when the fire occurred. The fire had made great headway before it was discovered. Several hundred workmen battled the flames all night with hose lines and extinguishers. Burning oil and explosions of the gasoline in the various vehicles aided in spreading the fire.

December 1, Oswego, N. Y. Oswego Soy Products Corp. Loss: $500,000.

This plant occupied a three-story unsprinklered brick-joist building and was engaged in the processing of soy beans. The building contained a motor-driven bucket conveyor having frame enclosed legs operating from the first to the upper floors. This conveyor is believed to have been in operation when the fire was discovered in the leg of the conveyor on the first floor. Employees attempted to extinguish the flames before calling the fire department. When the fire department arrived, the flames had spread through the conveyor to all floors. The fire chief reports that dust explosions and quantities of soy bean oil contributed to the rapid spread and persistency of the fire. The blaze was extinguished after twenty-one hours, but not until the building was destroyed.

December 5, New Kensington, Pa. Multiple Occupancy. Loss: $374,000.

This was a three-story unsprinklered brick-joist structure, consisting of two units known as the Adolph and Connor Buildings. These units were separated by a party fire wall with unprotected openings. The building housed among others a drug store, grocery, bakery, stationer, and numerous offices. A large stock of drug store supplies was also stored on the second and third floors. The cause of the fire is not known, but it is believed to have started in the space between the first floor and the metal ceiling of the prescription laboratory in the basement. According to the fire chief, employees of the drug store fought the fire for a half hour before the fire department was notified. By this time the fire was spreading rapidly through unprotected floor openings and wall channels. Firemen were hampered by the congestion of the drug storage and also by a stairway from the grocery, which was heavily loaded with waste paper and boxes. The fire department also found water supplies insufficient in the immediate vicinity of the building and the fire chief ordered certain pumpers shut down. An adequate supply from large mains was available a block away, but apparently was not used. Losses have been estimated as follows: building, $146,000; contents, $208,000; indirect losses, $20,000.

December 14, Carbondale, Ill. Grocery Warehouse. Loss: $740,000-$865,000.

This huge unsprinklered single-story brick warehouse with joist on steel-trussed roof was discovered by employees to be on fire shortly after 3 A.M. The building, 400 feet long by 200 feet wide, formed substantially a single fire area. The flames, of undetermined origin, spread too rapidly to permit the use of standpipe hose or first aid extinguishers by the employees. Due to the large area the fire was beyond control when firemen arrived. A truck loading dock, housing eighteen vehicles valued at $200,000, communicated with the warehouse section through manually operated steel doors, which were open at the time of the fire. Losses were estimated at approximately $300,000 on the building and $440,000 or more on the contents. This warehouse, occupied by the Kroger Grocery & Bakery Co., served 146 retail outlets located in four states.

December 15, Sorel, Que., Can. Group Fire. Loss: $300,000.

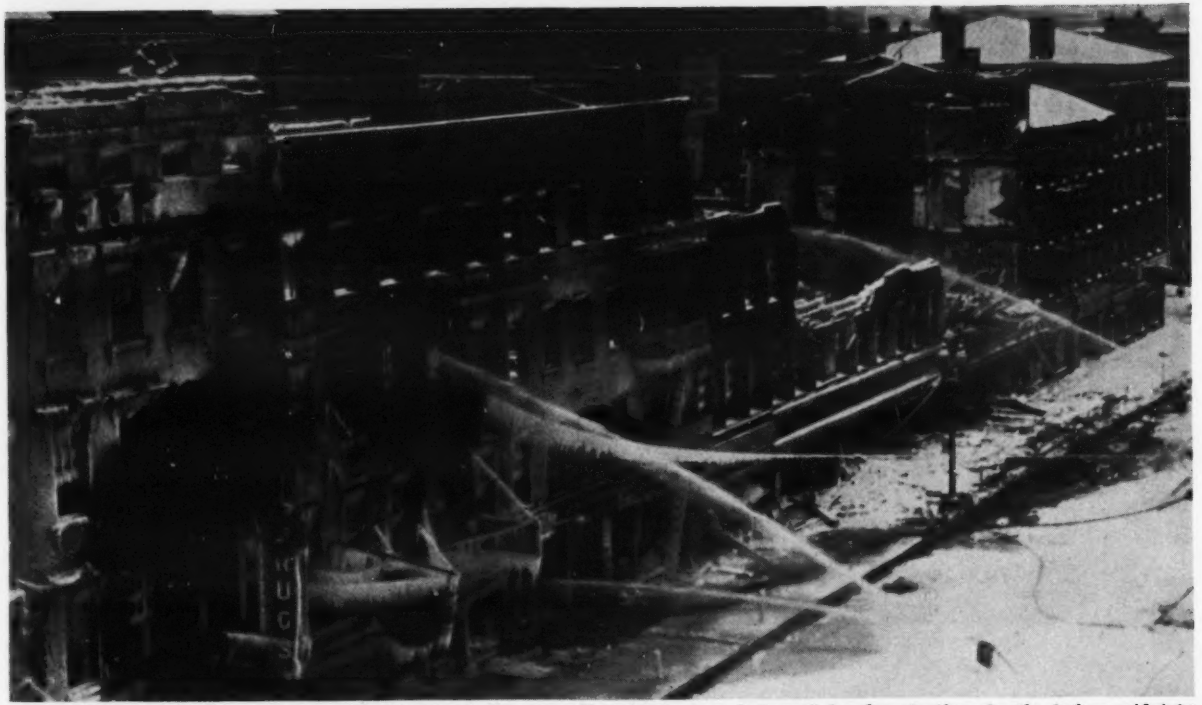
A group of 2-, 3-, and 4-story brick-joist, store, apartment and dwelling structures was destroyed or damaged by a fire which was discovered after 11 P.M. in the rear of a general store in the 4-story Richelieu Apartment building. The blaze soon spread to a 3-story store and tenement block adjoining. Help was called from Montreal, fifty miles distant, and from a near-by military post.

A congested group of store, apartment and dwelling structures without effective cut-offs were destroyed by a fire during sub-zero weather at Sorel, Quebec, on December 15. The loss was reported at $300,000.

Before the apparatus from Montreal arrived the blaze was declared under control and the Montreal firemen were turned back. About 5:00 A.M., after a portion of the fire fighters had left the scene, the blaze broke out with renewed vigor and spread through three more stores and six dwellings. While complete details are not available as to the adequacy of fire fighting operations, it seems obvious that a congested area of combustible construction without effective fire stops, coupled with winter weather, was in a measure responsible for the extent of the damage.

December 19, Denver, Colo. Cobusco Steel Products Co. Loss: $340,000.

Fire started at 4:45 A.M. in the first floor of this unsprinklered 2- and 3-story brick-joist steel products plant manufacturing projectiles for anti-tank guns. The plant was 500 feet in length and covered an area of 40,000 square feet. A steel heating furnace had shut down for repairs and oil in the quench tank had been pumped into a sump tank outside the building. This latter operation was performed to give access to a conveyor at the bottom of the tank which needed adjustment. Upon completion of repairs the normal procedure would have been to refill the quench tank. However, the operator failed to close the valve at the recirculating system and started the pump, which threw oil from the outside sump tank into the room at seventy-five pounds pressure. The oil vaporized and ignited when thrown over the heat treating furnace. Three explosions occurred as the pump continued to add fuel to the fire. The alarm was given by the watchman of an adjoining plant through a private box. Due to the large undivided area the fire swept rapidly through the plant. The nearest water supply for hose streams was 1200 feet distant. Some fire companies were delayed in reaching the scene because a bridge, washed out in a spring flood, had not been replaced. The loss amounted to $300,000, largely uninsured. Fortunately a considerable part of the machinery can be salvaged.



The Empire Hotel, a 96-year-old landmark at Syracuse, New York, was destroyed by fire starting shortly before midnight December 29. This brick-joisted structure, 3 and 4 stories in height, was pierced by open stair and light shafts, which permitted the rapid upward sweep of the fire, which began on the first floor. Nine persons were reported missing. The loss was estimated at $800,000 or more.

December 20, near Burlington, N. C. Barnwell Bros. Warehouse. Loss: $500,000.

This was a large unsprinklered warehouse of brick construction located about one mile outside the city limits. Fire occurred during the early morning, due to the "explosion" of an oil stove. By the time the fire department arrived, the roof was already falling in. There was only one hydrant available for use and little could be done to check the fire. Twenty trucks and trailers loaded with merchandise were destroyed. Further details are lacking.

December 21, Jackson, Mich. Group Fire. Loss: $290,000.

One mercantile building was destroyed and two others damaged in a general alarm fire which originated in the basement of Oppenheim's, Inc., retail clothing store and haberdashery. Oppenheim's, Inc., occupied an unsprinklered three-story brick-joist building with open stairways from the basement to the third floor. The fire was discovered during the early morning by a policeman who noticed smoke coming from a second story window and flames coming from the basement. The fire was fought for about twenty-nine hours before it was entirely extinguished. The spread of the fire was rapid, resulting in the destruction of the building and severe fire, smoke and water damage to two adjacent buildings. The total loss, including indirect losses, has been estimated at about $290,000.

December 21, Quebec, Que., Can. Group Fire. Loss: $300,000.

One of two extensive fires occurring in the city simultaneously, on a day when temperatures were below zero, this blaze started in an unsprinklered garage and spread to a paint factory, furniture warehouse, shoe factory, another garage and three dwellings. Automatic and outside open sprinklers operated and prevented destruction of a seriously exposed shoe factory which, however, suffered considerable water damage. Large areas of combustible construction mutually exposed were important factors in the extent of this fire.

December 22, Oklahoma City, Okla. Kings Laundry. Loss: $375,000.

Fire of undetermined origin almost totally destroyed this steam laundry establishment, which lacked automatic sprinkler protection. It apparently started near the receiving doors and spread very rapidly through open-slatted bins containing unwashed bundles of clothing. The watchman discovered the fire, but being unfamiliar with the telephone, consulted the engineer and asked him to call the fire department. They were driven from the building before anything was done. Passing police called the fire department. By the time the firemen arrived the building was completely involved. The boiler room was separated by standard brick fire walls and was undamaged by the fire. Owners report loss at $75,000 on building damage and $300,000 on contents.

December 24, Kokomo, Ind. Kokomo Sanitary Pottery Corp. Loss: $296,000.

Fire due to insufficient clearance between a pottery kiln and the wood roof structure, destroyed this fair-sized plant which manufactured bathroom fixtures. The fire was discovered by the night watchman on his regular rounds. He and another workman attempted to extinguish the fire with a hand extin-

Thirty refinery storage tanks containing aviation gasoline were destroyed in a fire at the Pure Oil Co. refinery at Nederland, Texas, on December 29. The loss is estimated at $500,000. Newspapers report that the plant would be completely shut down for 10 days following the fire before even partial operations could be resumed.

guisher before calling the fire department, but the fire was too far advanced to be controlled by hand appliances. Instead of using the public fire alarm box which was near by, the watchman telephoned for the fire department. Failure to use the alarm system was significant because it would have notified the water works engineer to increase the pressure in the water system. As it was, the water supply was inadequate, and there was some delay in getting the pressure increased. The fire department responded promptly, but the fire had reached general alarm proportions before they arrived. It burned fairly well out in about three hours, leaving the plant in ruins. The plant was of inferior construction, was not properly subdivided and lacked fire protection facilities. It had expanded over a period of years, but its fire protection had not kept pace with its growth.

December 29, Syracuse, N. Y. Empire Hotel. Loss: $800,000-$1,000,000.

This 96-year-old landmark was destroyed by fire believed to have started in one of the first floor stores shortly before midnight. The first alarm was immediately followed by a general alarm and the fire was brought under control after 24 hours, firemen working most of the time in a deluge of rain, followed by a sharp drop in temperature and heavy snowfall. Nine persons are reported missing in the ruins. There were more than 100 guests registered, many of whom were overcome and had to be carried down ladders. Located in the heart of the down-town area, the building was one, three and four stories in height, of 33,000 square feet ground area, and having brick walls and joisted floors and roof. Various open stairs and at least one open light shaft penetrated the upper floors. The building was without automatic sprinklers and only scant extinguisher or standpipe equipment was maintained. A thorough inspection of the Empire Hotel had been made only three weeks before during the course of a city-wide inspection stimulated by the Cocoanut Grove disaster. It revealed locked doors barring fire escapes, unused rooms piled high with combustibles, unmarked fire exits, unlighted stairways and no adequate fire alarm system. According to a news report, efforts had been made to comply with the fire regulations, but in place of a fire alarm system, installation of which was balked by lack of priorities on critical materials, orders had been given for a man to be on duty at all times to operate the buzzer system connected with all rooms.

December 29, Nederland, Texas. Pure Oil Company. Loss: $500,000.

A gasoline explosion followed by fire caused serious damage to this refinery. A large quantity of equipment and aviation gasoline was destroyed. Further details have not been reported.

Factors Responsible for Large Losses.

Following is an analysis of the factors responsible for the large losses. In every fire, several factors contributed to the rapid spread of the flames and the excessive loss.

Reasons for Large Losses.

	No. Times Contributing
Structural Factors	
Inferior construction, excessive areas, etc.	53
Lack of sufficient exposure protection	17
Unprotected vertical openings	26
Occupancy Factors	
Highly flammable contents, excessive amounts of burnable stock	22
Flammable liquids and gases	15
Unsafe heating equipment	9
Contents of unusually high value	4
Fire Protection	
Lack of adequate private protection	51
Lack of fire doors or cut-offs between sections	20
Fire doors blocked open or otherwise inoperative	1
Lack of adequate public protection	11
Sprinkler system shut off	7
Fire Fighting	
Fire difficult of access	12
Poor fire fighting by employees	4
Fire department inadequately manned or equipped	3
Inexperience in fighting fires of such magnitude	12
Fire department delayed	5
Delays in Giving Alarm	
Headway of fire when discovered	32
Efforts made to extinguish without giving alarm	12
Watchman became confused	4
Lack of public fire alarm system	4
Fire alarm box out of order	2
Water Supplies	
Inadequate water supply	11
Shortage of hydrants	5
Weather Conditions	
Strong wind	10
Low humidity	2
Extreme cold	1
Explosions	5

...it's easy for a saboteur to cripple your sprinkler

unless— it is under constant electrical supervision by an outside Central Station... Simply by closing a valve to shut off the water supply, a saboteur can cripple an unsupervised sprinkler system.

For your sprinkler, like any mechanical device, can be no better than the care and attention it receives. Routine periodic inspections reveal nothing except the condition of the sprinkler at the moment and give no assurance that all vital elements affecting the supply and distribution of water will *remain* in proper operating condition *between inspections.*

A.D.T. Central Station Supervision safeguards your sprinkler against sabotage. The closing of any shut-off valve, or any other condition that might impair the sprinkler's effectiveness — whether caused by accident or malicious intent — is instantly and automatically reported to the Central Station, which immediately investigates every trouble condition and initiates prompt corrective action. A.D.T. supervision also makes the sprinkler system function as an effective automatic fire alarm, automatically summoning the fire department the instant a sprinkler head opens.

Write for further information on this and other A.D.T. Electric Protection Services which are helping establishments in all fields to combat the threats of sabotage, fire and burglary.

A.D.T. SPRINKLER SUPERVISORY AND WATERFLOW ALARM SERVICE

Controlled Companies of **AMERICAN DISTRICT TELEGRAPH CO.** *155 Sixth Ave., New York*

CENTRAL STATION OFFICES IN ALL PRINCIPAL CITIES OF THE U.S.

A·D·T

Electric Protection Services

AGAINST FIRE · BURGLARY · HOLDUP

A NATION-WIDE ORGANIZATION

. . . because PYRANOL *cannot* burn

PYRANOL transformers have extra protection against fires from internal arcing, also against external fires because the cooling liquid is noninflammable. That's why the Underwriters' Laboratories approve Pyranol and why the National Electrical Code permits the installation of Pyranol transformers indoors without expensive fireproof vaults as previously required.

Recommend Pyranol Transformers for Safety with Savings

Plant managers and engineers will be glad to use Pyranol transformers not only because they provide extra safety, but also because they can be placed right where they should be placed—close to the load they are to serve. This makes possible short secondary leads—vital copper is saved, voltage regulation is improved, installation time and expense are reduced.

For complete information on Pyranol, and for facts that will show to office-building managers and industrial-plant engineers how they can save money by installing Pyranol transformers, write for Bulletin GEA-2637. *General Electric Co., Schenectady, N. Y.*

GENERAL ELECTRIC

402555-5100

Battery of C-O-TWO Cylinders

DEPENDABLE *and* APPROVED

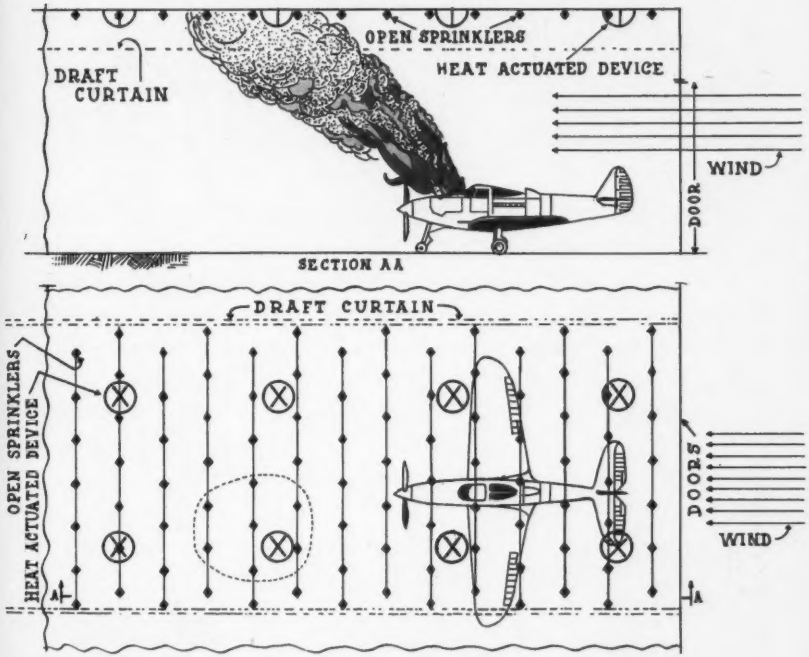
All C-O-TWO* equipment employs carbon dioxide, the fastest non-damaging fire extinguishing agent. At Grand Coulee, Boulder Dam, Bonneville Dam and other mighty power plants C-O-TWO automatic and manually operated fire extinguishing systems and C-O-TWO portables protect the turbines, transformers and oil storage vaults against fire. C-O-TWO hand and wheeled type portables or hose units are especially recommended for oil, grease, paint, lacquer, alcohol and electrical fires. C-O-TWO is a non-conductor. It does not deteriorate.

**C-O-TWO is a registered trade mark. To be safe, specify C-O-TWO and this company's name when ordering.*

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK, NEW JERSEY

"Canvas Engineering" Stopped This Needless Destruction
Because Flammable Canvas presents a major hazard indoors or out, from sabotage or carelessness—Wm. E. Hooper & Sons Company, with more than a century of "Canvas Engineering" behind them, did something about it.
The result was the first practical fire-, water-, weather- and mildew-resistant canvas — FIRECHIEF FINISHED HOOPERWOOD DUCK, widely used throughout industry and now serving every branch of Uncle Sam's armed forces. (Many millions of yards meeting all government specifications.) The culmination of years of research and development—the success of this phenomenal material lies not in the finish alone but in the construction of the canvas itself, so woven to insure maximum working strength, thorough penetration of the finish, and freedom from irregularities which would impair efficiency in service.
Matching individual needs with the particular canvas construction best suited to the job has been a Hooper tradition since 1800. Today, our entire production is mobilized for Victory. But when business returns to normal, this sound "Canvas Engineering" will mean much to Industry in extending the usefulness of Cotton Duck.
WM. E. HOOPER & SONS CO.
New York PHILADELPHIA Chicago
Mills: WOODBERRY, BALTIMORE, MD.
Since 1800 (through six wars) the HOOPER name has symbolized highest quality in Cotton Duck and other Heavy Cotton Fabrics, Paper Mill Dryer Felts, Filter Cloth, Rope and Sash Cord
HOOPERWOOD
DUCK
BALTIMORE
HOOPERWOOD COTTON DUCK

TYPICAL **AIRPLANE HANGAR** SHOWING EFFECT OF WIND THROUGH OPEN DOORS ON COLUMN OF HEATED AIR FROM A FIRE



WET PIPE SYSTEM OF TOMATIC SPRINKLERS WET PIPE SPRINKLERS TH AUTOMATIC WATER TAIN ARE INSTALLED:

• The heated air is blown away from the region over the fire and, after a relatively long time, opens a few automatic sprinklers (those enclosed by dotted area, or heat column, approximated on the plan). These sprinklers that open do not put water on the fire and, by cooling the air at the ceiling, they prevent the sprinklers over the fire from opening until the fire has reached destructive proportions. Airplanes on either side of the burning plane can take fire since the wind is also blowing the heated air away from them, retarding the fusing of the automatic sprinklers over them for a long time. Intensity of fire can become so great as to rupture gasoline tanks—which, in turn, will create a fire of such magnitude that it cannot be confined by an automatic water curtain of open sprinklers.

IF DELUGE SYSTEM OF OPEN SPRINKLERS IS INSTALLED

• The heated air is blown away from the region over the fire—but, the Rate-of-Rise Heat Actuated Devices beyond that region quickly react to the *sudden rise* of temperature and open the Deluge Valve. This sends water discharging from *all* the open sprinklers connected to the Deluge Valve, which generally covers about 50′ x 100′ or more. Thus, the open sprinklers discharge water directly on the fire and on all adjacent airplanes as well . . . preventing the other planes from igniting. A fire occurring between two Deluge Systems will operate both systems.

• • •

"AUTOMATIC" SPRINKLER CORP. OF AMERICA

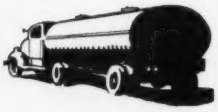
YOUNGSTOWN, OHIO • OFFICES IN PRINCIPAL CITIES

FIRE SAFEGUARDS FOR GASOLINE STORED OR IN TRANSIT!

Gasoline in the hands of an experienced man is as safe as the milk in a baby's bottle--but when handled by a novice, it can be as destructive as T.N.T. The oil companies who store and transport gasoline are by training 'safety minded' and coöperative with the fire prevention authorities. They cannot buy additional equipment and they are confronted with a certain hazard in employing inexperienced help. Your greatest service to them, and to your community, is insistence that the safety equipment they have installed works properly, that it is regularly inspected and carefully maintained.

Write

WE are always happy to send our catalogs to fire prevention authorities so that they may be kept abreast of the latest developments in safety equipment.



SHAND & JURS COMPANY

BERKELEY, CALIFORNIA

NEW YORK CHICAGO HOUSTON LOS ANGELES SEATTLE

SHAND & JURS

FREE!

—THIS FIRE-FIGHTING POSTER

Do your new employees know how to use your fire-fighting equipment? If not, here's the answer.

Walter Kidde & Company have prepared a graphic poster that quickly teaches correct operation of most widely used types of portable fire extinguishers. It covers Carbon Dioxide, Foam, Water, and Vaporizing Liquid. It tells for what kind of fire each is used . . . *and how it is used.* Simple in design, it can be understood at a glance, even after a fire is under way.

Display one of these posters beside every one of your extinguishers. Just write Walter Kidde & Company for the number you need.

Walter Kidde & Company
Incorporated
137 WEST STREET, BLOOMFIELD, N. J.

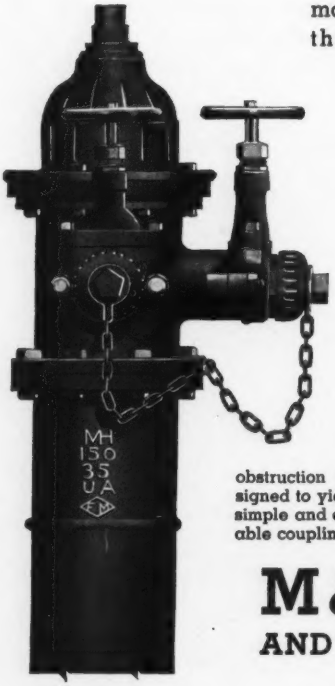
K Kidde

Fire-Fighters Appreciate

VALVES
HYDRANTS

AND PIPE LINE ACCESSORIES

M & H products are well known for high quality material and expert workmanship. They have been widely used throughout the country for many years. They include several types of Gate Valves, Check Valves, Flap Valves, Valve Boxes, B & S Fittings, Flanged Fittings, Fire Hydrants and many other cast iron pipe line accessories.



AWWA & UNDERWRITERS APPROVED FIRE HYDRANTS

M & H Fire Hydrants are dry top and revolving head. They are easy to lubricate. Maintenance costs are low due to simplicity of design and rugged construction. They have low friction loss and great efficiency because barrel diameter is not reduced and there are no working parts or obstruction in waterway. Special Traffic model is designed to yield at the ground line under impact. Repair is simple and easy by renewing breakable bolts and breakable coupling on stem.

M&H VALVE
AND FITTINGS COMPANY

ANNISTON, ALABAMA

Get the Facts on ROCKWOOD Engineered WaterFOG

1. *Absorbs More Heat*
2. *Cools Wider Area*
3. *Prevents "Flash-Back"*
4. *Saves Costly Chemicals*
5. *Lessens Water Damage*

WHAT IS WaterFOG?

WaterFOG is water—broken up into particles much finer than spray—by impinging streams of water through specially designed nozzles or heads.

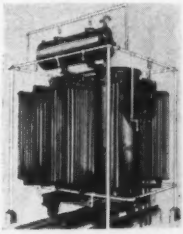
Changing into steam, WaterFOG penetrates into and absorbs heat in the combustion area, expands with an irresistible smothering action, and envelops the fire in an all-extinguishing, all-quenching blanket. Costly damage from chemicals or excessive use of water is avoided.

Note raging flames cut off in mid-air by smothering, confining WaterFOG applied through six WaterFOG heads on overhead installation of fixed piping.

WaterFOG Safeguards Chemicals

Fixed installations of WaterFOG protect Butadiene storage tanks from premature polymerization and fire hazard.

WaterFOG PROTECTS TRANSFORMERS



Being a non-conductor, WaterFOG has been successfully applied to electrical fires, preventing conflagration, and cooling the entire endangered area.

WaterFOG Is Approved

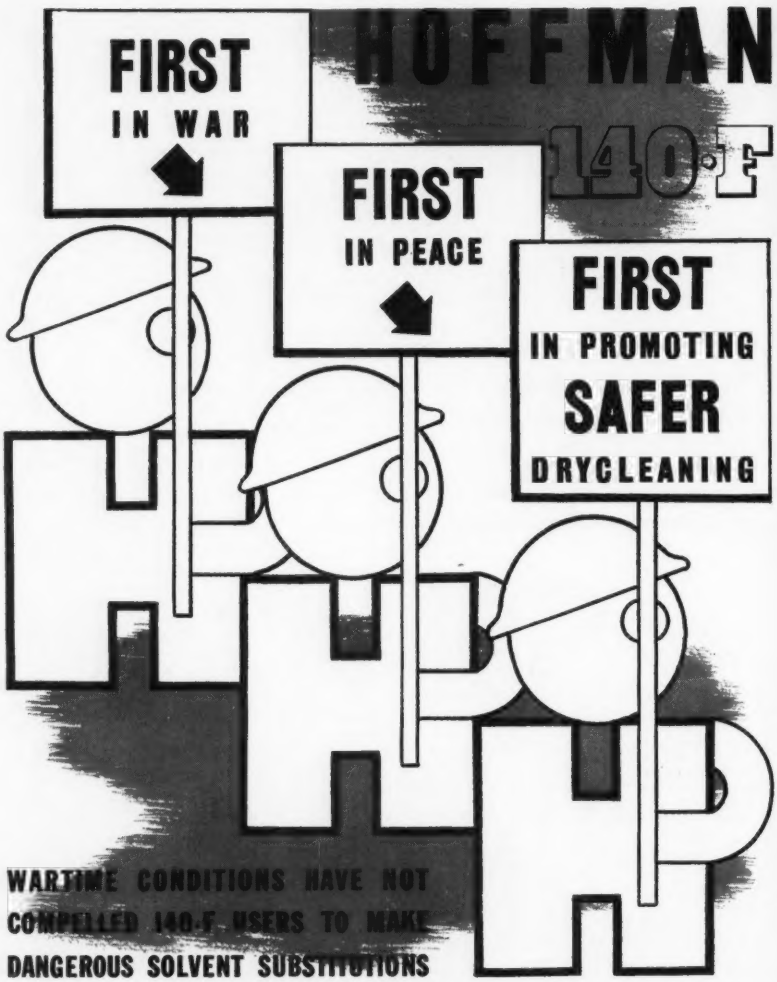
Properly applied to specific hazards — by Rockwood engineers, experts in hydraulics as well as fire protection—WaterFOG is approved by the Navy Department, Bureau of Marine Inspection and Navigation, Underwriters' and Associated Factory Mutual laboratories.

U. S. Government demand for WaterFOG equipment makes necessary high priorities in order to insure prompt delivery.

Write, today, for Bulletin 123, addressing Rockwood Sprinkler Company, 56 Harlow St., Worcester, Mass. A colored moving picture with sound is also available on request by an executive of your firm.

ROCKWOOD WaterFOG

WATER, ENGINEERED BY ROCKWOOD, COOLS, CONFINES, SMOTHERS OIL FIRES



Drycleaners using Hoffman 140-F Safety Petroleum Solvent Drycleaning Systems are still able to continue their legitimate operations—using 140-F Class II machinery with listed high flash petroleum solvents. Unlike users of some other types of machinery they have not been compelled by war shortages to use these solvents in equipment not designed for petroleum solvent operation.

U. S. HOFFMAN MACHINERY CORPORATION
105 Fourth Ave. - New York, N.Y.
EQUIPMENT FOR EVERY DEPARTMENT OF THE DRY CLEANING PLANT

Your copy of this bulletin will be sent on request.

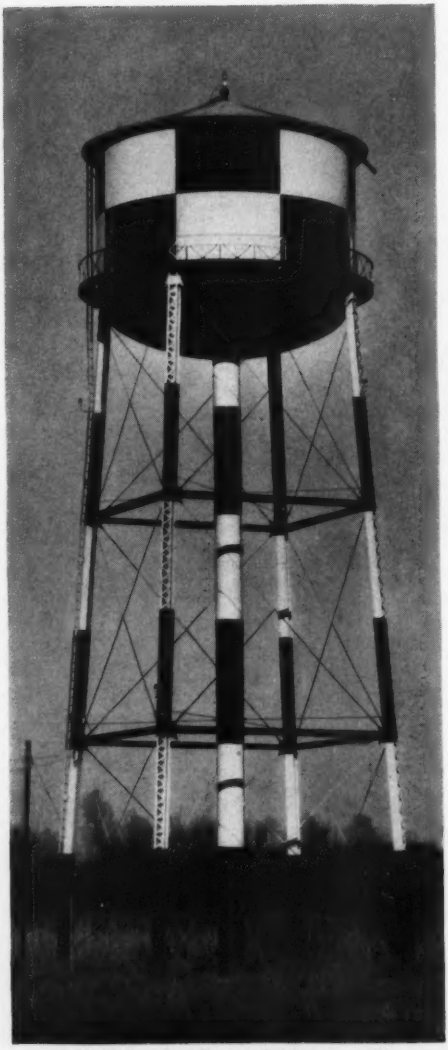
VIKING

Supervisory Equipment for Industrial Sprinkler Systems

VIKING supervisory equipment guards against sprinkler system failure. Don't take the chance of having the water supply shut off from YOUR sprinkler system. VIKING can supply you with the necessary supervisory devices to give an electric alarm or signal whenever any essential valve on your sprinkler system is disturbed from its normal wide-open position, or if the pressure gets too low.

THE VIKING CORPORATION

HASTINGS, MICHIGAN



100,000-gal. ellipsoidal-bottom elevated water tank for sprinkler service

FIRE PROTECTION FOR INDUSTRIAL PLANTS

At first glance you might think this 100,000 gal. elevated tank to be at an army camp or flying field. Actually it provides gravity water pressure for the automatic sprinkler system in an industrial plant. The plant is near an air route, hence the painting for visibility from the air.

For obvious reasons, this view was made looking away from the buildings. At the photographer's back was a modern plant. Day and night the supply of water in the tank guards that plant against fire so that production will go on. Whenever a fire breaks out, the flames will quickly open a sprinkler head and be quenched by water from the tank before they have a chance to gain headway.

If you have a sprinkler system with a gravity supply at your plant, check it regularly to be sure that it is in working order at all times.

CHICAGO BRIDGE & IRON COMPANY

CLEVELAND · CHICAGO · BIRMINGHAM · NEW YORK
WASHINGTON · HAVANA · GREENVILLE, PA. · PHILADELPHIA
HOUSTON · HILLSIDE, N. J. · TULSA · SAN FRANCISCO

DEFENSE AGAINST FIRE IS AN OFFENSE AGAINST OUR ENEMIES

Star Automatic Sprinklers guarantee the continuity of production and the preservation of essential war materials already completed.

Automatic Sprinklers
Corrosion-Proof Sprinklers
Directional Flow Sprinklers
Open Sprinklers
Ornamental Sprinklers
Alarm Devices

Automatic Releases
Alarm Valve (Wet) Systems
Dry Pipe Valve Systems
Deluge Systems
Heat-Actuating Devices
Pre-Action Systems

Star Automatic Sprinklers and Fire Protection Devices bear approval of all Insurance Authorities having jurisdiction and various Governmental Agencies.

Proven economy in installation cost and maintenance has dictated the consistent policy of Star Sprinkler Corporation in distributing its Fire Protection Devices through local licensed contractors who have had a lifetime of experience in the installation of automatic sprinkler systems. Operating throughout the United States, Canada and South America, Star licensees, due to their strategic locations, can render instant service. Write us for name and address of Star licensed contractor nearest your location.

STAR SPRINKLER CORP.

Westmoreland and Collins Sts. - Philadelphia, Pa.

FACT-O-CRETE floors

A Moderate Cost, Light Weight, Seamless, Heavy Duty Floor Laid in Plastic Form Over Wood . . .

★ **FIREPROOF** ★ **OILPROOF**
★ **WATERTIGHT** ★ **PAINTPROOF**
★ **SPARKPROOF** ★ **WEARPROOF**

★ Recommended by Fire Underwriters to Prevent Water Damage and Spark Hazard in Spray Booth, Paint Storage and Similar Industrial Areas.

• In 1927 a fire starting in the finishing room on the top floor of this furniture factory released the sprinkler system. The loss attributable to fire was $30,000—that to water damage amounted to nearly $500,000. Fact-O-Crete, laid over the entire spray booth area, forming a drained, watertight pan with 6-inch high wall and column bases and floor ramps, has positively prevented a recurrence. The original floor after 16 years of service still passes the Underwriters' requirements.

FACT-O-CRETE easily and rapidly installed is fully guaranteed. Cost estimates and specifications for installations given promptly upon receipt of job conditions and areas.

FREE Sample: Write for a full size sample of Fact-O-Crete showing its application to a wood subfloor.

Warehouses in Wichita, Kansas, and New York City.
Address all correspondence to

E. H. O'NEILL FLOORS COMPANY
105 West Adams St., Chicago, Illinois

O'NEILL FLOORS

GLOBE

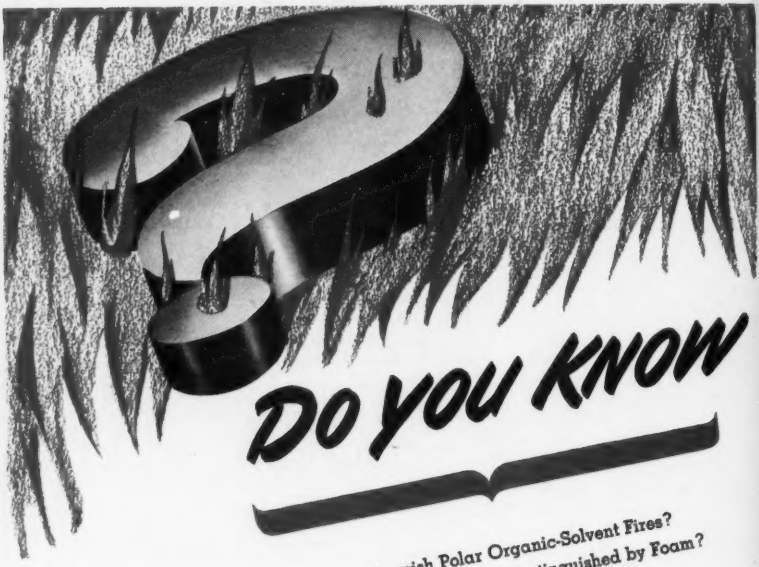
AUTOMATIC SPRINKLERS

KEEP THE WHEELS OF INDUSTRY TURNING

We are proud of the part Globe automatic fire extinguishing apparatus is playing in the protection of our war industries against destructive fires. Globe Saveall Sprinklers are safeguarding the production of many of our plants turning out the weapons with which Victory will be won.

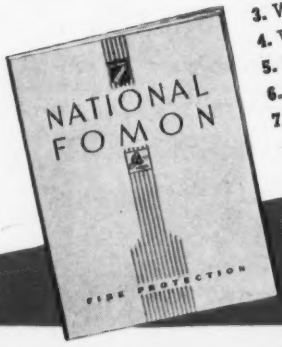
Globe engineers will gladly discuss your fire protection problems with you. Globe devices embody a maximum of engineering ingenuity with a minimum of critical materials and are approved by all government and underwriting authorities.

GLOBE
Automatic Sprinkler Co.
2035 WASHINGTON AVENUE
Philadelphia, Pa.
SALES OFFICES IN PRINCIPAL CITIES



DO YOU KNOW

1. How to extinguish Polar Organic-Solvent Fires?
2. What kind of Fires are best extinguished by Foam?
3. What is the best method to apply Foam?
4. When to use a Portable Foam Generator?
5. When to use a Built-in System?
6. When to use a Single Line Service?
7. When to use a Dual Line Service?



You will find the complete answers to these important Fire Protection Questions . . . and informative technical data, too . . . in the 32-page Bulletin.
Write for your copy of Bulletin B- 7.

NATIONAL FOAM SYSTEM, INC.

Fire Protection Specialists in the Oil Industry

PHILADELPHIA NEW YORK CHICAGO

"EVERY INGREDIENT OF NATIONAL IS AMERICAN"

HUGE FIRE LOSSES IMPEDE WAR EFFORT

To call the Fire Department when fire occurs is elementary, yet the record shows that Delayed Alarms are contributing largely to the appalling destruction of national resources. Witness the following few of many instances:

S.S. "NORMANDIE." " . . . a delay of 10 to 15 minutes between the start of the fire and the first alarm received by the fire department. The fire apparatus arrived in 90 seconds after the alarm was given. The S.S. *Normandie* is reported to have cost $53,000,000.00."

JERSEY CITY WATERFRONT CONFLAGRATION. Loss: $5,000,000.00. "There appears to have been some delay in sounding the alarm, estimated by city authorities at 20 minutes."

WAREHOUSES. Loss: $1,000,000.00. "When the fire was discovered by the watchman the flames had already burned the telephone wires and he had to go a quarter of a mile to a railroad roundhouse to telephone the alarm."

BRONZE AND ALUMINUM FOUNDRY. Loss: $1,000,000.00. "Employees were apparently unable to locate fire alarm boxes with which the plant was equipped and an alarm was telephoned to the fire department."

FALL RIVER RUBBER FIRE. Loss: $11,000,000.00. "The foreman's attempts to extinguish the fire with an extinguisher were futile. A delay of six minutes or more appears to have occurred."

Fire alarm boxes, adequately distributed, provide the most dependable means for calling the Fire Department. Deficiencies in Signaling Systems cannot be eliminated now, materials are not available, but greater safety may be achieved by the intelligent use of existing facilities.

When Fire Occurs — Use the Box Immediately

• • •

THE GAMEWELL COMPANY

NEWTON UPPER FALLS
MASSACHUSETTS

PUT A CEILING

On Your Fire Losses!

Today, more than ever before, fire is a dangerous enemy —and it can strike suddenly and unexpectedly. If it is stopped immediately, the loss is small. Given a few minutes to gain headway, it can wipe out machinery and equipment impossible to replace — destroy men and war materials sorely needed by a hard pressed nation!

There is one sure way to put a ceiling on such needless fire losses. Install a Grinnell Automatic Sprinkler System. Day and night it will stand guard to stop a fire at its start. For over half a century, Grinnell Automatic Sprinklers have been protecting millions of lives and billions of property dollars against fire.

You can choose a type of Grinnell Sprinkler System for every fire hazard. Each is designed to provide the utmost in automatic fire protection for specific conditions. Complete information is available for the asking from any of our offices throughout the country. Grinnell Company, Inc., Executive Offices, Providence, R. I.

GRINNELL

AUTOMATIC SPRINKLER FIRE PROTECTION